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A MONOGRAPH
OF THE
FREE AND SEMI-PARASITIC
COPEPODA OF THE BRITISH
ISLANDS.

BY
G. STEWARDSON BRADY, M.D., F.L.S.,
PROFESSOR OF NATURAL HISTORY IN THE UNIVERSITY OF DURHAM COLLEGE
OF PHYSICAL SCIENCE, NEWCASTLE-ON-TYNE; CORRESPONDING
MEMBER OF THE ZOOLOGICAL SOCIETY OF LONDON,
OF THE ACADEMY OF NATURAL SCIENCES
OF PHILADELPHIA, ETC.

VOL. II.

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A MONOGRAPH
OF THE
BRITISH
FREE AND SEMI-PARASITIC COPEPODA.
VOL. II.

SECTION I.—GNATHOSTOMA, *Thorell*—(continued).

Family 6. HARPACTICIDÆ, Claus (in part).

38 BODY cylindrical, or, sometimes, flattened. Abdomen, in most cases, not sharply separated from the cephalothorax. First pair of antennæ short, composed of few (4—10) joints, scarcely ever reaching beyond the edge of the first body-segment; in the male forming on both sides a clasping organ. Second pair 2—4-jointed, bearing a secondary branch which is usually small and made up of 1—4 joints. Mandibles strongly toothed, provided with a palp which is either simple, consisting of one or two joints, or more complex and composed of a basal portion with two branches; in a few cases forming a laminated branchial appendage. Maxillæ usually well developed, consisting of a dentated cutting segment and a more or less complex palp, which is made up of several setiferous digits arranged in a somewhat radiated manner. First pair of foot-jaws armed at the extremity with several strong teeth, and on the inner margin with several (usually

three) wart-like, setiferous processes. Second pair sometimes foot-like, but mostly forming a strong prehensile uncinatè hand. First pair of feet mostly (though not always) different from the following pairs and converted into a prehensile apparatus; second, third, and fourth pairs adapted for swimming; fifth pair 2-jointed, foliaceous; different in the two sexes, the basal joint usually dilated and more or less embracing the smaller apical joint. Eyes as in *Cyclops*. Heart wanting. Copulative organs in the female symmetrical, in the male usually asymmetrical. Ovisac in most cases single, rarely double.

This family, according to the arrangement here adopted, contains thirty-three genera* and eighty-one species, and is therefore by far the largest of the nine families coming within the range of the present Monograph. The limits of the family are precisely those adopted by Claus and Boeck, except that the group erected by the former author into a separate family under the name *Peltididæ* are here (as also by Boeck) included amongst the *Harpacticidæ*. There is, in fact, no important structural difference between the two, the point relied on by Claus as distinctive being the flattened form of the *Peltididæ*, which is of no great importance in itself, and is found in certain species of some genera (*e.g.* *Thalestris*), the normal form of which is cylindrical. The cylindrical form, with an abdomen not much narrowed, and not markedly distinct from the cephalothorax, must, however,

* Excepting *Cylindropsyllus*, which cannot at present be referred with certainty to any family.

be looked upon as the typical form of the family ; the genera which depart from this rule being *Zaus*, *Peltidium*, *Porcellidium*, *Idya*, and *Scutellidium*, all of which are to a greater or less extent flattened from above downwards. *Amymone*, on the other hand, presents a peculiarity of the opposite kind, being flattened laterally. The two pairs of antennæ do not present any remarkable abnormalities of structure ; the mandibles, however, vary very considerably, more especially as to the degree of development of the palp, which in some cases is reduced to very small dimensions (*Canthocamptus*, *Attheyella*, *Laophonte*, &c.) ; the maxillæ also vary a good deal in development, and in *Longipedia* approach very nearly to the shape of the same organs in the *Calanidæ*. The usual digitate, sub-triangular shape of the first pair of foot-jaws is lost in some genera, as in *Ectinosoma*, *Idya*, and *Scutellidium*, where these limbs are prehensile and clawed ; the second foot-jaw constantly takes the form of a powerfully clawed prehensile hand except in the genera *Longipedia*, *Ectinosoma*, *Zosime*, and *Bradya* (sub-family *Longipediinæ*), where it approaches somewhat to the structure seen in *Calanidæ* and *Cyclopidae*. The first pair of feet has in general one or both branches adapted for prehension, and more or less powerfully clawed ; but in the genera belonging to the sub-families *Longipediinæ*, *Tachidiinæ*, and *Amymoninæ*, it is formed for swimming, being nearly or quite like the following pairs. The second, third, and fourth pairs are always natatory organs, and the outer branches are always 3-jointed ; the inner branch, however, has a variable number of

the inner branch much elongated. Fifth pair, in the male, foliaceous; in the female rudimentary.

1. LONGIPEDIA CORONATA (*Claus*), Pls. XXXIV and XXXV.

Longipedia coronata, Claus. Die frei-lebenden Copepoden, p. 111, taf. xiv, figs. 14—24 (1863).

— — Boeck. Oversigt Norges Copepoder, p. 29 (1864).

Anterior antennæ short, 5-jointed, thickly beset on the outer border with stout hairs, many of which are strongly pectinate or plumose; in the female (Plate XXXIV, fig. 3) the antenna tapers somewhat toward the extremity and terminates in two or three long, simple setæ, the last joint being the longest and most slender; in the male the organ is thicker, obtuse, and more distinctly arcuate, the whole outer margin beset with very strongly pectinate and plumose setæ; the apex bears two stout falciform processes, and two or three similar (but setose) appendages occur amongst the hairs of the outer margin of the antenna. The posterior antenna (Plate XXXV, fig. 1) consists of two nearly equal branches, the main branch being composed of four joints, of which the second and fourth are the smallest; the secondary branch of six nearly equal joints which are short in the female (fig. 1) and longer in the male (fig. 2). The first pair of swimming feet is armed in the male (fig. 4) with somewhat longer spines than in the female (fig. 3). The inner branch of the second pair of feet (fig. 5) is in both sexes much elongated, reaching in the female as far as the

termination of the thorax, in the male to the middle of the abdomen, the last joint constituting about three fourths of the whole length of the limb and bearing three terminal and three lateral spines. The feet of the third pair (fig. 6) are rather larger than those of the fourth (fig. 7), and bear a series of marginal spines on the first and second joints of the inner, and on the second joint of the outer branch. The fifth foot in the male (Plate XXXIV, fig. 8) consists of a moderately broad central lamina bearing about eight marginal setæ, two of which are much longer than the rest and are situated near the apex; the two lateral segments are smaller, one bearing a very long curved seta, the other a short apical filament only; the fifth pair in the female (fig. 9) is rudimentary, consisting only of four short setæ. The first segment of the abdomen of the male (Plate XXXV, fig. 8) has two lateral spines on the inferior angles, while the fourth segment is armed with a long, downward-pointing posterior spine; the female abdomen has none of these appendages, and the caudal segments (fig. 9) are much narrower and more divergent than in the male; the longest of the two principal tail setæ is equal to about twice the length of the abdomen. Length, $\frac{1}{18}$ th of an inch (1.4 mm.).

Longipedia coronata is often taken abundantly by the dredge on sandy or gravelly bottoms in depths of from one to thirty fathoms or more; it also occurs, though in less abundance, on muddy bottoms and amongst the fronds of fuci between tide-marks. It is readily distinguishable from all other species by the great length of the inner branch of the second swimming foot; the

well as their spines, fringed on the outer margins with closely-set, stout, spine-like setæ. Basal joint of the fifth pair of feet (fig. 9) produced internally into a narrow quadrate lamina which bears two stout, apical spines of moderate length and a series of about eight spine-like setæ on the inner margin; the outer margin of the basal portion forms a slender process which is tipped with a plumose filament; second joint broader and shorter, tripartite at the apex, each lobe giving origin to a single seta, the innermost of which is the shortest. Caudal setæ of moderate length. Length of animal $\frac{1}{30}$ th of an inch (1.3 mm.).

I was at one time disposed to consider this very well characterized species as identical either with Boeck's *E. melaniceps* or *E. curticornis*, though differing from the former in several important points, especially in the absence of any black markings on the head and in the configuration of the fifth feet; in this last respect it also seems to differ from *E. curticornis*, so that on the whole it seems best to assign to it a new specific name, *spinipes*. It is very generally distributed round the British Islands in water of moderate depth—from low-water mark to forty fathoms, and has been observed in the following places:—at various points off the Durham and Yorkshire coasts in company with *Longipedia coronata*, but not so abundant; in tide-pools, Aranmore, Ireland; Lough Swilly, two fathoms; Scilly Islands, ten to forty fathoms; Douglas (Isle of Man), two to three fathoms; Little Cumbrae (Clyde), on weeds at ebb tide; on weeds at Tobermory (*Rev. A. M. Norman*).

2. ECTINOSOMA MELANICEPS, Boeck. Pl. XL, figs. 17—20.

Ectinosoma melaniceps, Boeck. Oversigt Norges Copepoder, p. 30 (1864).

Anterior antennæ 6-jointed (fig. 17), slender, gradually tapering, the first two joints short and rather stouter than the rest; third joint about twice as long as the fourth or fifth, last joint very small. Second foot-jaw (fig. 18) slender; the long middle joint finely setose on both margins, last joint having three slender apical spines. Swimming feet (fig. 19) much as in the preceding species, but having the setæ and spinous armature much more slender and delicate. Basal joint of the fifth foot (fig. 20) short and broad, its inner margin devoid of setæ and reaching only about half the length of the outer segment, bearing two apical setæ, one of which is very short and stout; outer margin produced and having a small apical hair; second segment broad and short, 4-cleft at the extremity, each digit bearing a single seta, all of different lengths. Tail-segments very short. Length $\frac{1}{30}$ th of an inch ($\cdot 84$ mm.).

This species does not differ very much from the foregoing. It is, however, much smaller and more delicate in structure, and is moreover always distinguishable by a cloudy blackish patch on the head. Its habitat is chiefly amongst weeds or mud, whilst *E. spinipes* haunts, as has been already stated, sandy or gravelly ground. I have found *E. melaniceps*

sparingly amongst weeds near low-water mark at St. Mary's, Scilly, and in a gathering taken from the fronds of *Laminariæ* in Shetland by the Rev. A. M. Norman. Mr. Norman has also more recently (1877) taken it at Oban.

3. *ECTINOSOMA ERYTHROPS*, *nov. sp.* Pl. XXXVI, figs.
11—17.

Anterior antennæ 6-jointed, mandibular palp having only a single terminal seta. First foot-jaw (fig. 14) slender, terminal claws long and slender, middle joint of second foot-jaw having only one long marginal seta. Swimming-feet destitute of marginal spines, their inner branches more elongated than in the preceding species (fig. 16). Fifth pair of feet (fig. 17) much shorter than in the two preceding species, and having much longer setæ, the longest of which is at least three or four times longer than the foot itself; basal segment having two setæ on its inner portion; terminal segment small, reaching not much beyond the inner portion of the first segment and bearing three long apical setæ. The head (fig. 11) bears close to its anterior margin two distinct, brilliantly red, eye-spots. Length, $\frac{1}{40}$ th of an inch (·65 mm.).

A small, but apparently very distinct, species of which I have seen only a few specimens, all of them taken by the dredge in depths of from five to thirty fathoms off the coasts of South Durham and North Yorkshire,

4. ECTINOSOMA ATLANTICUM (*Brady and Robertson*). Pl.
XXXVIII, figs. 11—19.

Microsetella atlantica, B. & R. Ann. and Mag. Nat. Hist., ser. iv,
vol. xii, p. 130; pl. ix, figs. 11—16 (1873).

Body $\frac{1}{80}$ th of an inch in length (fig. 11), excessively slender, almost linear and much attenuated both behind and in front: tail-segments (fig. 19) very short and divergent. First cephalothoracic segment curvate, much attenuated in front, and equal in length to the five following segments. Anterior antennæ (fig. 12) slender, 6-jointed, sparingly setose; posterior large, 3-jointed, the first joint bearing a long 2- (or 3- ?) jointed secondary branch (fig. 13). First foot-jaw 2-jointed, short and stout, provided with several apical setæ; second foot-jaw (fig. 16) 3-jointed, with two or three curved claw-like setæ at the apex. First four pairs of feet nearly alike; long and slender; branches of nearly equal size (fig. 17). Fifth pair (fig. 18) 2-jointed; internal portion of the basal joint produced nearly as far as the apex of the second joint, and bearing three apical setæ, one of which is very long; second joint smaller, and bearing two long setæ. The caudal segments have two principal setæ (fig. 19), the innermost of which is very short, the other as long as the entire body of the animal. Colour yellowish.

Taken in the surface-net by Mr. E. C. Davison in the open sea as follows:—Lat. 53° 24' N., long. 15° 24' W.; lat. 53° 15' N., long. 11° 51' W.; lat. 51° 22'

N., long. $12^{\circ} 25\frac{1}{2}'$ W.; and at 40 miles off the Skelligs; sparingly also in Kinsale Harbour.

This species was described by Mr. Robertson and myself (*loc. cit.*) as the type of a new genus—*Microsetella*; but on further examination I find no sufficient grounds to maintain its separation from *Ectinosoma*. The general habit and appearance of the animal coincide entirely with that genus; but it is worthy of note, that, while all other members of the genus seem to haunt the bed of the sea, this has been found only near the surface, being taken by the tow-net. I have never noticed its occurrence amongst dredged material.

The mouth organs being so extremely minute, I have not succeeded in obtaining a satisfactory view of all of them. There seems to be a mandible-palp, but I have not been able to see it with sufficient distinctness to describe or figure it; and the same may be said of the maxillæ.

Genus 3. ZOSIME, Boeck (1872).

Anterior antennæ 6-jointed, very short and stout; posterior 2-branched, accessory branch 2-jointed; mandible-palp composed of a large basal portion and two small branches. First pair of foot-jaws having three marginal setiferous digits; second pair small, 3-jointed, simple, terminating in a few setæ. First pair of feet having the outer branch composed of three, the inner of two joints; both branches of

three following pairs 3-jointed. Fifth pair small, 2-jointed.

1. ZOSIME TYPICA, Boeck. Pl. XXXIX, figs. 1—12.

Zosime typica, Boeck. Nye Slægter og Arter af Saltvands-Copepoder, p. 14 (1872).

Female.—Body robust, truncated in front; no distinct separation between thorax and abdomen, head small, coalescent with first thoracic segment; rostrum short, thick, and squared at the apex, which bears two small hairs; abdomen but little more slender than the cephalothorax, tail-segments much narrower than the last abdominal ring. First two joints of the anterior antennæ large and nearly equal, each of them equal to the united lengths of the four following joints; all except the first joint densely clothed on the outer margin with stout, strongly plumose hairs (fig. 3). Second pair of antennæ (fig. 4) 3-jointed; basal joint about as long as the two following, and giving origin to a large triarticulate secondary branch; both branches plentifully provided with strongly plumose spine-like setæ. Mandible short, broad, and strongly toothed (fig. 5) at the extremity; basal joint of the palp produced internally into a digitiform process (*a*). Maxillæ composed of a broad main segment (fig. 6), with three or four small setiferous digits. Second foot-jaws (fig. 8) having three apical setæ, one long and plumose, the other two small. The two joints of the inner branch of the first foot are of equal length;

the marginal spines of the outer branch are strongly pectinate (fig. 9) towards the apices, and the longer setæ are plumose. The basal joint of fifth pair of feet (fig. 11) is short and broad, and bears three long plumose setæ, the second joint is quadrangular, small, and has three apical setæ, one much longer than the other two; in the *male* (fig. 12) the segments of the fifth foot are even less developed, but bear an almost exactly similar set of setæ. The abdominal segments are produced downwards at the angles into short spines. The caudal segments are short, about twice as long as broad, having two short spines on the outer margin and two at the apex, the longest of which is about equal in length to three rings of the abdomen; while the smaller is barely half as long as the other. Length, $\frac{1}{8}$ th of an inch ($\cdot 9$ mm.).

Several specimens of this curious and distinctly characterized species were dredged twenty miles off Sunderland, on a bottom of muddy sand in forty-five fathoms water; also five miles off Hartlepool on a sandy bottom. M. Boeck's specimens were taken amongst mud in Christiania fiord in a depth of sixteen fathoms.

Genus 4. BRADYA, Boeck (1872).

Anterior antennæ very short, 7-jointed; inner branch of the posterior antennæ of moderate size, 2-jointed ("3-jointed," Boeck). Mandible-palp large, 2-branched. Maxillar palp well developed. First

foot-jaw large, 5-jointed (Pl. XXXVIII, fig. 6); basal joint elongated and provided with three marginal setiferous digits, second joint very long, third, fourth, and fifth extremely short, and bearing several long setæ. Second foot-jaw much shorter, 3-jointed, the last joint short and bearing three curved terminal setæ. First four pairs of feet nearly alike (fig. 8); both branches composed of three joints and adapted for swimming. Fifth pair small, 2-jointed.

1. *BRADYA TYPICA*, Boeck. Pl. XXXVIII, figs. 1—10.

Bradya typica, Boeck. Nye Slægter og Arter af Saltvands-Copepoder, p. 15 (1872).

Body $\frac{1}{30}$ th of an inch in length, cylindrical, exhibiting no distinct separation between thorax and abdomen; caudal segments tapering, and much narrower than the last abdominal segment. Anterior antennæ (fig. 2) very short, 7-jointed; fifth and seventh joints the smallest; all beset on the outer margin with long setæ; inner branch of the posterior antennæ (fig. 3) as long as the outer branch, but much more slender, 2-jointed. Mandible (fig. 4) having rather slender teeth, but a large palp the basal joint of which is much elongated and bears two branches of moderate size. Basal joint of the first foot-jaw (fig. 6) large; its three marginal processes somewhat long and slender, each bearing about three apical setæ; second joint also long and slender; three following joints very

short and armed with numerous setæ of moderate length. Lower foot-jaw (fig. 7) 3-jointed; first joint short and stout, second rather longer and having a pectinate series of small cilia near the middle; last joint very short and armed with three strong, curved, and plumose setæ at the apex. The outer margins of all the joints of the first four pairs of feet (fig. 8) are fringed with spines, and their longer setæ have pectinate margins. Fifth pair of feet small (fig. 9), the basal joint triangular and bearing two long setæ on the inner and one on the outer angle; second joint smaller, subquadrangular, bearing four setæ, two of which are of equal length with those of the basal joint; the other two much shorter.

I have seen only very few examples of this species, not more than a dozen; these were taken off Porcressa Bay (Scilly Islands) in a depth of twenty fathoms, and off Hartlepool in twenty-five fathoms on a sandy bottom. M. Boeck's specimens were found in company with the previous species, *Zosime typica*.

There may, perhaps, be some doubt whether the species here described is rightly referred to M. Boeck's *Bradya typica*. In some points the two appear to differ, the only important divergence being, however, as to the number of joints on the inner branch of the posterior antennæ. But this is a point upon which a mistake may very readily be made; indeed it is one by no means always easy of determination, even when attention is specially directed to it. I regret that an insufficient supply of specimens has prevented my satisfying myself as to this particular,

and also as regards the maxillar palp, of which, very possibly, my figure may be inaccurate.

Sub-family 2. TACHIDIINÆ, Boeck.

The species belonging to this sub-family agree with the *Longipediinæ* in having the first almost exactly like the three following pairs of feet, adapted for swimming and not for grasping, and in having all the branches of the swimming feet 3-jointed; the accessory branch of the second antenna consists of one or two joints and is mostly small; the second foot-jaw forms a clawed hand and is adapted for prehension, and the fifth foot consists usually of only one joint. To this division belong the genera *Tachidius*, *Euterpe*, and *Robertsonia*.

Diagnosis of Genera of Tachidiinæ.

Both branches of first pair of feet	{	2-jointed.....	<i>Euterpe.</i>
		3-jointed; secondary branch of posterior antenna	1-jointed..... <i>Tachidius.</i>
			2-jointed..... <i>Robertsonia.</i>

Genus 5. TACHIDIUS, Lilljeborg (1853).

Cephalothorax broad, and not distinctly separated from the abdomen; head united with first thoracic segment; abdomen in both sexes 5-jointed. Anterior antennæ (Pl. XXXVII, fig. 4) very short, 7-jointed.

Posterior antennæ 2-jointed, with a minute 1-jointed inner branch. Mandible-palp short (fig. 6), consisting of a basal portion and two short 1-jointed branches. Maxilla armed with several curved teeth (fig. 7), and having a small bilobed setose palp. First pair of foot-jaws (fig. 8) divided into several setose segments; second pair elongated (fig. 9), 3-jointed, forming a grasping hand, which terminates in a curved claw. First four pairs of feet (fig. 10) nearly alike; both branches 3-jointed. Each foot of the fifth pair consists of a single broad fringed plate, larger in the female than in the male. Ovisac single.

1. *TACHIDIUS BREVICORNIS* (Müller). Pl. XXXVII.

- | | | |
|------------------|---|---|
| | | <i>Cyclops brevicornis</i> , Müller. Zool. Dan. Prodr., 2414 (1776). Entomotraca, p. 118 (1785). |
| — | — | Fabricius. Faun. Groen., 240 (1780). |
| <i>Tachidius</i> | — | Lilljeborg. De Crustaceis ex ord. trib., p. 196, tab. xxii, figs. 12—16; tab. xxiii, figs. 1, 2, 9; and tab. xxiv, figs. 17, 18 (1853). |
| — | — | Brady. Nat. Hist. Trans. Northumberland and Durham, v. iii, p. 130, pl. v, figs. 1—9 (1868). |
| — | — | Boeck. Oversigt Norg. Copepoder, p. 33 (1864). |

Body robust, produced into a short, blunt rostrum; body-segments fringed on their posterior margins with rows of minute teeth; last three abdominal segments about equal in length, those of the tail (fig. 16) rather longer than broad. Anterior antennæ of the *female* (fig. 4) 7-jointed; first two joints large, third, fourth, and fifth short and nearly equal, sixth nearly as long as the two preceding, seventh very small, the whole limb beset

with rather long hairs, some of which are plumed with strong spine-like setæ; in the *male* the fifth and sixth joints form a large vesiculiform swelling (fig. 3), the last joint forming a strong claw; a curved spine is also attached to the outer margin of the swollen joint (fig. 3 a). Posterior antennæ 2-jointed, the secondary branch (fig. 5) small, 1-jointed. In the *male* the *inner* branch of the second pair of feet (fig. 11) has its marginal setæ much reduced in size, and the second joint has attached to its apex a strong spine which is nearly as broad and quite as long as the much narrowed terminal joint; the *outer* branch of the third pair has also very small marginal seta and is armed at its extremity with three strong spines (fig. 12), one of which is very long. Fifth pair of feet in both sexes broad, subquadrate, single-jointed, much larger in the female (fig. 13) than in the male (fig. 14), and bearing several marginal setæ, some of which are plumose. The innermost of the two principal tail setæ is much the longest, and both are finely aculeate throughout (fig. 16). The first abdominal segment bears on its outer angles (fig. 15) two spines. Eye small, situated near the base of the anterior antenna. Colour grey or yellowish brown. Length $\frac{1}{40}$ th of an inch (.65 mm.).

There are probably few brackish marsh-pools in which *Tachidius brevicornis* may not at times be found, more especially in the autumn months, when long-continued warmth has developed many successive broods of these rapidly multiplying tribes. In pools of this kind I have found it often in great abundance, the following being some of the localities of which I

have memoranda :—Seaton Sluice (Northumberland), Hylton Dene and Hartlepool (Durham), Oulton Broad, Maningtree, and Lake Lothing (Suffolk), pond at St. Mary's, Scilly Islands.

Genus 6. EUTERPE, Claus (1863).

Anterior antennæ 7-jointed. Second pair of foot-jaws elongated, 3-jointed, armed with a long, slender claw. Both branches of the first pair of feet 2-jointed. Abdomen in both sexes 5-jointed.

1. *EUTERPE GRACILIS, Claus. Pl. XL, figs. 1—16.*

Euterpe gracilis, Claus. Die frei-lebenden Copepoden, p. 109, t. 14, figs. 1—13 (1863).

Body slender, produced into a stout rostrum anteriorly, somewhat sigmoid in outline when seen from the side, the dorsal cephalothoracic margin being strongly arched (fig. 1). Abdomen short, about as long as the last three thoracic segments, and not sharply separate from the thorax. Anterior antennæ 7-jointed; shorter than the first body-segment; in the *female* (fig. 3) slender, beset somewhat sparingly with hairs, and bearing on the fourth joint (fig. 3a) a stout setose appendage; length of the several joints nearly equal; in the *male* (fig. 2) the fifth and sixth joints are coalescent, and form an elongated vesiculiform swelling; last joint

very small and armed with a long, curved, apical claw, the whole forming a powerful prehensile organ. The posterior antennæ are 3-jointed and rather large, the basal joint giving attachment to an accessory branch composed of a single joint, which is smaller in the female than in the male (fig. 4); in the latter sex it is armed at the apex with a falciform claw, which, according to Claus, is used as an auxiliary clasping organ. The mandibles (fig. 5) are short and stout, strongly toothed, and bearing a short 2-branched palp. The maxillæ (fig. 6) are strongly toothed, and have a 2-jointed clawed palp. The upper foot-jaw (fig. 7) bears three marginal digits, which, as well as the terminal segment, are provided with plumose setæ; the lower (fig. 8) is exceedingly long and slender, 3-jointed, with a very long curved claw at the apex. The swimming-feet of the first pair are 2-branched, each branch consisting only of two joints; and in the *male* (fig. 9) the inner branch is sharply flexed, the terminal joints of both branches bear on the inner margin and at the apex five long, finely-plumose setæ, but neither of them possesses a prehensile claw. The three following pairs of feet have both branches 3-jointed, the inner branch, however, being in each case much shorter than the outer (figs. 10, 11, 12); all the setæ of these limbs are plumose, but those belonging to the first joint much more strongly so than the rest. The fifth foot in the *female* is foliaceous, elongated, subovate (fig. 13), bearing at the broad apex five spines, of which the three median ones are plumose; on the middle of the external margin there is also a spine of nearly

similar size; in the *male* the fifth pair of feet (fig. 14) is rather smaller, and consists of two tapering laminæ which are closely united almost to the apices, each of which bears two nearly equal spines, the external margins each having two slender setæ; the first male abdominal segment (fig. 15) has attached to it a pair of small bisetose appendages, much like rudimentary feet. Caudal segments (fig. 16) subconical, a little longer than the last abdominal ring; tail setæ two, the innermost much the longer, stout and finely aculeate along the margins, somewhat shorter than the abdomen, but about five times as long as the outer one. The animal is of a deep brown colour, and is $\frac{1}{40}$ th of an inch in length (·65 mm.).

The only specimens of this species which I have seen occurred in a tow-net gathering made by my friend, Mr. E. C. Davison, in Kinsale Harbour, Ireland, during the cruise of the "Porcupine;" there were several examples, but, except one or two, all were males. The type-specimens described by Dr. Claus were taken at Heligoland, these two localities being at present the only recorded habitats of the species.

Genus 7. ROBERTSONIA, *nov. gen.*

Abdomen separated by a distinct constriction from the cephalothorax; anterior antennæ short, 7- or 8-jointed; inner branch of posterior antennæ of moderate size, biarticulate; mandible-palp composed of a large

basal joint and two small branches; anterior foot-jaw short and broad, posterior 3-jointed, well developed, forming a prehensile hand. First four pairs of feet nearly alike, each branch 3-jointed; fifth foot foliaceous, 2-jointed. Last joint of the inner branch of the second pair in the male converted into two or three strong spine-like processes.

1. ROBERTSONIA TENUIS (*Brady and Robertson*).

Pl. XLI, figs. 1—14.

Ectinosoma tenue, B. & R. Proceedings of the British Association, p. 196 (1875).

Length $\frac{1}{8}$ th of an inch. Moderately robust; head united with the first thoracic segment, and produced into a long falcate rostrum (fig. 1); abdomen distinctly narrower than the cephalothorax, and composed of five segments, the posterior margins of which are finely spinulose, and have three or four somewhat larger spines at the outer angles (fig. 14). Anterior antennæ 8-jointed, short, only about half the length of the first body-segment; in the *female* densely beset on the outer margin with long hairs, some of which are strongly pectinate (fig. 2); in the *male* (fig. 3) the joints are irregularly swollen at the distal, and constricted at the proximal extremities; the fifth joint is produced on the outer margin, and bears a thick, club-like appendage (fig. 3a), the limb altogether being not so densely setose as in the female. Posterior antennæ (fig. 4) 2-jointed, the large basal joint giving attachment to a slender, biarticulated inner branch, which

bears two apical and two marginal setæ; the last joint of the main limb is armed with several spine-like setæ at the apex and on the outer margin, and the basal joint has one strong plumose seta. Mandible (fig. 5) broad and strongly toothed at the extremity; basal joint of the palp large. The maxilla (fig. 6) consists of a small masticatory segment, and a 4-digitate palp, the extremities of all the digits bearing three or four long setæ. The anterior foot-jaw (fig. 7) has three marginal digits; the posterior (fig. 8) is 3-jointed, first and second joints subequal, third small, slender, and having three apical setæ, one of which is longer than the others and forms a slender claw; the basal joint has four marginal setæ, two attached at the apex being very long; the second joint has a series of about eight setæ on its inner margin. The inner branch of the first pair of feet (fig. 9) is rather longer than the outer branch, the terminal joints in both cases being rather long and slender; the outer margins are fringed with spine-like setæ, those at the apex of each joint on the outer branch being unusually large. The basal portion of the limb is armed with three strong spines (fig. 9, *a, a, a*), the innermost of which is broad and lancet-shaped; the second, third, and fourth pairs of feet are somewhat similar, but their setose armature is not quite so strong; in the *male* the third joint of the inner branch in the second pair (fig. 11) is converted into two spine-like processes and two slender setæ, while the setæ usually present on the inner margins of the first and second joints are quite rudimentary. The fifth foot (figs. 12, 13) is composed of two joints fringed

with numerous marginal setæ, some of which are plumose, the basal joint dilated and embracing the second joint; in the *male* the limb is much smaller and less profusely setose, the inner segment of the basal joint having only two strong apical spines and a fringe of fine cilia along the inner margin. The caudal segments are very short—the length being less than the width, and bear several short and two long setæ, the inner and larger of which is finely and shortly plumose, and about as long as the abdomen.

This very distinct and well-marked species is perhaps not uncommon off the Durham coast, a considerable number of specimens having been noticed in two dredgings,—off Hawthorn, in a depth of twenty-seven fathoms on a sandy bottom, and off Seaham, in thirty-seven fathoms amongst mud. It may be noted that these two localities are in close proximity.

Sub-family 3. AMYMONINÆ, Bocck.

Posterior antennæ 3-jointed, with a small 1- or 2-jointed inner branch; mandible-palp 1-jointed; maxillary palp 2-jointed, slender. Anterior foot-jaw 3-jointed, digitate; posterior strongly chelate; branches of first pair of feet 1-jointed, of following pairs 3-jointed.

One genus only—*Amymone*.

Genus 8. AMYMONE, Claus (1863).

Body much compressed. Dorsal margin very convex. Head and last thoracic segment very large, produced ventrally and approximating so as to give a more or less circular outline to the animal. Abdomen very short. Head united with the first thoracic segment. First pair of antennæ elongated, 6- or 8-jointed; second pair 3-jointed, and bearing a small 1- or 2-jointed secondary branch, last joint clawed. Mandible-palp 1-branched;* maxillar palp elongated, 2-jointed. First foot-jaw slender, 3-jointed; second much elongated, 2-jointed, and forming a strong grasping hand. First pair of feet not prehensile, 2-branched, each branch consisting of a single joint; second, third, and fourth pairs with both branches 3-jointed. Fifth foot in the female composed of two, in the male of one, joint. Integument excessively tough and coriaceous, usually cellular or areolated.

1. *AMYMONE SPHÆRICA, Claus. Pl. XLIX, figs. 1—11.*

Amymone sphericæa, Claus. Die frei-lebenden Copepoden, p. 114, t. xx, figs. 1—9 (1863).

— — Boeck. Oversigt Norges Copepoder, p. 32 (1864).

— *falcata*, Norman. Brit. Assoc. Report, p. 296 (1868).

* Boeck says *two*-branched—a mistake, unless his specimens belong to a different species from those here described. The statement of the same author as to the structure of the second and third pairs of feet is also erroneous ("outer branch 2-jointed, inner 3-jointed") both branches being always 3-jointed.

First segment of the body produced ventrally into a large triangular or broadly falciform promontory; last segment of the thorax and first of the abdomen coalescent, produced in the female into a doubly-hooked projection, and in the *male* into a long triangular process, which nearly meets that of the cephalothorax (represented by the dotted line in fig. 1); abdominal segments and tail setæ very short. Anterior antennæ in the female 8-jointed, slender, and tapering; nearly as long as the first body-segment; joints decreasing in length from the first to the sixth, last three nearly equal; in the *male* the first, second, and fourth joints are long (fig. 2) and nearly equal, the third, fifth, and eighth very short; a hinge between the sixth and seventh joints; in both sexes the outer margin of the limb is clothed with short hairs. Posterior antennæ (fig. 3) 3-jointed, long and slender, the first joint giving attachment to a small 1-jointed, secondary branch, which bears several apical setæ; the last joint is clawed at the apex, and has likewise three or four moderately long setæ. Mandible (fig. 4) slender; palp 2-jointed. Maxilla (fig. 5) slender; palp 2-jointed, first joint short, second long, slender, and curved, each joint bearing three or four strong, curved, apical setæ. First foot-jaw 3-jointed (fig. 6), last joint very slender, and, like the previous one, giving origin to a setiferous process. Second foot-jaw (fig. 7) very long and strong, forming a powerful, chelate, prehensile limb, the hand elongated, ovate, bearing a comb-like series of teeth on the inner margin; claw long and curved. The four pairs of

swimming-feet are nearly equal in length, but the branches of the first pair (fig. 8) are only 1-jointed, and their marginal setæ are comparatively short; branches of the three following pairs slender, the outer branch (fig. 9) having two apical spines, one long and one short; setæ of the inner margins long and slender. Fifth pair in the *female* foliaceous, 2-jointed, bearing a few marginal setæ (fig. 10), the joints nearly equal in length; in the *male* (fig. 11) 1-jointed, elongated, curved, bearing two long setæ at the apex, and one on the outer margin. Colour deep yellowish brown. Length $\frac{1}{3}$ rd of an inch (.77 mm.).

Dredged in twenty-five fathoms four miles off Marsden (Durham) amongst rough sand; in thirty-five fathoms off Robin Hood's Bay (Yorkshire), amongst *Filagrana implexa*, and off Red Cliff (Yorkshire): Oban (Rev. A. M. Norman). The Rev. A. M. Norman also records the occurrence of "*A. falcata*," which I believe to be properly referable to this species, "amongst *Laminariæ* in Bressay Sound" (Shetland). Dr. Claus's specimens were found at Heligoland and Naples, and Boeck's at Christiania.

2. *AMYMONE LONGIMANA*, Claus. Pl. XLIX, figs. 12, 13.

Amyrone longimana, Claus. Die frei-lebenden Copepoden, p. 115, t. xx, figs. 13, 14 (1863).

Anterior antennæ of the *female* stout and 6-jointed (Claus), of the *male* (fig. 12) closely similar to those of

the preceding species. Second foot-jaw (fig. 13) long, the hand stout and subtriangular; terminal claw short and stout; the prominent inner margin of the hand armed with a row of about eight spine-like setæ. Length $\frac{1}{50}$ th of an inch ($\cdot 5$ mm.).

One specimen only was dredged in a depth of twenty-seven fathoms off Hawthorn (Durham).

Sub-family 4. STENHELIINÆ, nov. sub.-fam.

In this section the inner branch of the first pair of feet is 2- or 3-jointed, has its first or last joint more or less elongated and the limb partially adapted for grasping by means of an imperfect hingement at the apex of the first joint; the second, third, and fourth pairs have both branches 3-jointed; the mandible-palp is large and 2-branched, and the inner branch of the posterior antenna is 2- or 3-jointed, and of moderate size.

The genera are *Stenhelia*, *Ameira*, *Jonesiella*, and *Delavalia*.

Diagnosis of Genera of Stenheliinæ.

Inner branch of first pair of swimming- feet	{	2-jointed	{ shorter than the outer branch <i>Delavalia</i> .
			{ longer than the outer branch <i>Jonesiella</i> .
	{	3-jointed; secondary branch of posterior antenna	{ small, 1-jointed <i>Ameira</i> .
			{ 3-jointed <i>Stenhelia</i> .

Genus 9. STENHELIA, Boeck (1864).

Anterior antenna 8-jointed; inner branch of the posterior antenna of moderate size, 3-jointed, median joint very small. Mandible-palp composed of a well-developed basal joint and two small 1-jointed branches. Masticatory segment of the maxilla provided with a few strong apical claws and two smaller setiferous digitate segments; from the outer margin spring three small setiferous tubercles; first pair of footjaws having one large terminal claw and three or four digitiform setose processes; second forming a grasping hand. All the branches of the swimming-feet 3-jointed, the inner branch of the first pair elongated, its first joint being often about as long as the whole outer branch; last two joints small, and terminating in three long setæ without any claw. Fifth pair foliaceous, 2-jointed. abdomen in both sexes 5-jointed.

The characters which chiefly distinguish this genus from the *Tachidiinæ* are the structure of the inner branch of the first foot, the well-developed mandibular and maxillar palps, and the 3-jointed inner branch of the posterior antenna. From all except *Robertsonia* it is also separated by the 2-jointed fifth foot.

1. *STENHELIA HISPIDA*, *nov. sp.* Pl. XLII, figs. 1—14.

Female.—Animal rather slender; head united with

the first thoracic segment, and produced into a long curved rostrum (fig. 1). Abdomen (fig. 1) 5-jointed, the first two joints not coalescent. Anterior antenna 8-jointed, the second joint reaching to the extremity of the rostrum; the fourth joint is somewhat longer than the preceding three, and the last four are much shorter and more slender, their entire length being only equal to that of the two preceding joints; the second, third, fourth, and eighth joints each bear several apical setæ, the other joints very few. Middle joint of the inner branch of the posterior antenna (fig. 4) very small. The second foot-jaw (fig. 8) has two spine-like setæ on the inner margin of the slender, oblong hand. Outer margins of the swimming-feet densely fringed with spine-like setæ; first joint of the inner branch of the first pair elongated, nearly twice as long as the two following joints; second joint smaller than the third; the outer branch scarcely reaches beyond the apex of the first joint of the inner branch; branches of the second, third, and fourth pairs all 3-jointed and nearly equal, joints long and slender (fig. 10). Fifth pair well developed (fig. 12), basal joint broad and long, fringed with small hairs and provided also with five stout plumose setæ on the apex and internal margin; second joint broadly ovate, bearing five marginal setæ. The third segment of the abdomen is the shortest, the fourth the longest; caudal segments about as long as broad; outer terminal setæ very thick for the first half, then suddenly tapering to a hair-like fineness (fig. 14); inner setæ about twice as long, stout and shortly plumose.

Male.—Anterior antenna (fig. 3) constricted between the third and fourth joints; fourth joint armed with a very robust rod-like appendage (fig. 3 *a*); first joint of the inner branch of the first foot much thickened (fig. 9), bearing a fringe of long spine-like setæ on the inner margin and one much longer apical seta; the basal portion of the foot has a large darkly-coloured chitinous tubercle on its inner margin, just above the origin of the inner branch (fig. 9 *a*). The second and third joints of the inner branch of the second foot (fig. 11) are converted into a long, chitinous, bayonet-like spine, which is tuberculated near the base. Fifth pair of feet (fig. 13) smaller and more angular than in the female, the basal segment having only two principal setæ; those on the outer margin of the second joint short and stout. The tail setæ in the male are not so stout as those of the female. Length $\frac{1}{3}$ th of an inch (1 mm.).

This fine species was first noticed by my friend the Rev. Alfred Merle Norman amongst Entomostraca washed off the fronds of *Laminariæ* at Tobermory; in this gathering it occurred abundantly. I have since dredged it in several places, but nowhere in great numbers:—Clew Bay (Ireland) ten fathoms; off Hartlepool five fathoms; and off Marsden (Durham) thirty fathoms; Portincross (Ayrshire) fifteen fathoms; Ventry Bay, Ireland (*Mr. E. C. Davison*).

The specific name *hispidæ* is the MS. name given by Mr. Norman to his specimens, and on that account is adopted here.

2. STENHELIA IMA, *Brady*. Pl. XLIII, figs. 1—14.

Canthocamptus imus, Brady. Nat. Hist. Trans. Northumberland and Durham, vol. iv, p. 436, pl. xix, figs. 1—5 (1872).

♀ — *rostratus*, Claus. Die frei-lebenden Copopoden, p. 122, t. xiii, figs. 5—8 (1863).

Animal very slender, rostrum slender, long, and fal-ciform; fourth joint of abdomen the longest. Anterior antennæ (fig. 2) very slender, the last four joints much thinner than the rest: third, fifth, sixth, and seventh joints short and nearly equal. In the *male* the second and fourth joints are much elongated (fig. 3), the latter bearing a stout rod-like appendage (fig. 3 *a*). Second foot-jaw very slender (fig. 8), the long thin hand having several hair-like spines on the inner margin. First joint of inner branch of first pair of feet very slender and longer than the outer branch, ciliated on both margins and bearing one long apical seta on the inner margin (fig. 9), second joint very short, third more than twice as long as second; three terminal setæ, one of which is much longer than the rest. Both branches of the three following pairs long, slender, and nearly equal; inner branch of the second pair in the *male* terminating in two slender spines and a long seta (fig. 10). Inner segment of the fifth foot in the *female* elongated, narrow, having five or six marginal setæ; second joint long and narrow, subovate, six-setose, the two apical hairs much the longest (fig. 12). The fifth feet of the *male* are very much shorter and proportionately wider (fig. 13). The

tail setæ are a good deal swollen at the base (fig. 14). Ovisac curvate, containing a small number of large ova ranged in a single layer. Length $\frac{1}{50}$ th of an inch (.85 mm.).

Hab.—Dredged in depths varying from ten to thirty-five fathoms, off Marsden on the Durham Coast, off Red Cliff, Staiths, and Robin Hood's Bay (Yorkshire); off Callum's Hole, Bute; Glen Sannox, Arran; St. Mary's, Scilly; and Clew Bay, Ireland.

This agrees very closely with the somewhat scanty details of character noted by Dr. Claus for *Canthocamptus rostratus*, but if that species really belongs to the genus *Canthocamptus* as defined by Dr. Claus (having the fourth foot only 2-jointed), it cannot be the same as the form now under consideration. With this uncertainty I retain my own specific name, though, if the two forms are really identical, the term *rostrata* should have the preference on account of priority.

Genus 10. AMEIRA, Boeck (1864).

Anterior antenna 8-jointed; inner branch of posterior antenna small, 1-jointed. Mandible-palp small, 1- or 2-branched. Branches of all the swimming-feet 3-jointed; outer branch of the first pair short; inner branch long, the first joint especially much elongated.

1. AMEIRA LONGIPES, Boeck. Pl. LIII, figs. 1—10.

Ameira longipes, Boeck. Oversigt Norges Copepoder, p. 49 (1864).

Rostrum of moderate length, obtuse; last abdominal segment longer than the preceding; tail segments about as long as broad. The second joint of the anterior antenna is much longer and wider than any of the following, the third joint is of moderate size, the rest short and nearly equal in length (fig. 1). Hand and claw of the second foot-jaw slender (fig. 5). First joint of the inner branch of first swimming-foot longer than the entire outer branch (fig. 6), ciliated on the outer margin, and bearing one long seta below the middle, and another at the apex; second joint short, with one apical seta, third twice as long as the second and bearing two long and one short setæ; the inner branches of the second, third, and fourth pairs are 3-jointed, and shorter than the outer; but the second pair in the *male* (fig. 8) has the third joint converted into a long slender spine; fifth pair small, the basal joint broad, its inner segment not much elongated (fig. 9), and armed with four setæ; second joint long, oval, ciliated on the lateral margins, and having five long terminal setæ; in the *male* the outer joint is much shorter (fig. 10), and the setæ of both joints are reduced both in number and size. Length $\frac{1}{30}$ th of an inch (.85 mm.).

A. longipes has been noticed in several dredgings, but would seem to occur sparingly, not more than

about one specimen having been seen in each case. The localities are as follows :—Off Portincross (Ayrshire) fifteen fathoms; off Sunderland and Seaham (Durham) twenty-five to forty-five fathoms; off Staiths (Yorkshire); and on roots of Algæ at Roundstone (Ireland).

This species is perplexingly near in many characters to *Stenhelia ima*, but is separated by the characters of the first antenna, the 1-jointed branch of the second antenna, and the outline of the fifth pair of feet. Boeck characterises the mandible-palp as 1-jointed, but in my specimens the 2-branched character is perfectly evident. Nevertheless the difficulty of distinguishing between this and *Stenhelia ima* is great, and, without dissection, insuperable. Indeed, I can scarcely resist the impression that the two forms may be varieties, or stages of development, of one and the same species.

Genus 11. JONESIELLA, nov. gen.

Body slender, of nearly equal thickness throughout. Abdomen not flexed on the thorax after death. Anterior antennæ small, 7- or 8-jointed; inner branch of posterior antennæ 2-jointed. Mandibles well developed; palp 2-branched. Second foot-jaw forming a clawed hand. Maxillæ and foot-jaws nearly as in *Stenhelia*. First pair of swimming-feet short, inner branch rather the longer, 2-jointed, bearing long terminal setæ, but no claws; second, third, and fourth

pairs having both branches composed of three joints ; basal joint of the fifth pair very broad, second joint smaller. One ovisac.

Seen from the side these animals have much the appearance of the genus *Ectinosoma*, the first body-segment being small and tapering towards the front, the abdomen also slightly tapering and extended persistently nearly in the axis of the cephalothorax ; the structure of the swimming-feet is also very similar, but the mouth-organs are entirely different. I have much pleasure in naming the genus after my old and valued friend, Prof. T. Rupert Jones, one of the first and most zealous workers amongst the fossil Entomostraca.

1. JONESIELLA FUSIFORMIS (*Brady and Robertson*). Pl. XLVIII, figs. 1—13.

Zosime fusiformis, B. & R. Brit. Assoc. Report, p. 196 (1875).

Body elongated, slender ; head and first thoracic segment coalescent, produced into a slender rostrum. Anterior antenna 7-jointed, short, the last four joints short and densely clothed with long hairs (fig. 2), some of which are strongly pectinate or plumose ; the fourth joint bears a long rod-like appendage (fig. 2 *a*), and the fifth a peculiar, branched, spine-like seta (fig. 2 *b*). In the *male* the antenna is irregularly corrugated, and has a large vesiculiform swelling of the fourth joint (fig. 3). Posterior antennæ stout, and armed on the second joint with several short spines, some of which have pectinate margins (fig. 4),

two or three being long and having their marginal spines produced so as to form short branches. Mandibles (fig. 5) broad and strongly toothed; basal joint of the palp large, and bearing two rather long, biarticulate branches. Masticatory portion of the maxilla (fig. 6) broad and strongly toothed; palp well developed. First two joints of the second foot-jaw (fig. 8) finely ciliated along the upper margins; the hand and nail both long and slender. First pair of swimming-feet (fig. 9) robust and short; inner branch rather longer than the outer, its second joint longer than the first; outer and apical margins of the joints fringed with large spines, those of the outer branch being shortly plumose, while the longer setæ are either finely plumose or strongly pectinate. The other swimming-feet have both branches 3-jointed and nearly equal, the outer margins spinous and the larger spines strongly pectinated (fig. 11). The inner branch of the second foot in the *male* has the middle joint produced into a large spine-like process (fig. 10), first joint marginate with strong spines, last joint long, slender, and bearing several long plumose setæ. Basal joint of the fifth foot in the *female* (fig. 12) broad and quadrate, with ciliated margins, and armed along the distal border with five or six large thong-like setæ of various lengths; outer joint much smaller, similarly armed, but having only one large and several small setæ. The fifth foot in the *male* (fig. 13) is of somewhat similar character, but much smaller; the outer joint is large in proportion to the inner, and the marginal spines are much fewer and smaller.

Caudal segments very short and broad; setæ finely aculeate. Length $\frac{1}{3}$ rd of an inch (1.1 mm.).

This species occurred plentifully in a dredging made off Porcessa Bay, Scilly, in twenty fathoms, on a bottom of hard sand; also, less plentifully, in thirty-five fathoms off Red Cliff, Yorkshire.

2. JONESIELLA SPINULOSA (*Brady and Robertson*). Pl. XLVIII, figs. 14—17; and Pl. XLIX, figs. 14, 15.

Zosime spinulosa, B. & R. Brit. Assoc. Report. p. 196 (1875).

This differs from the preceding species chiefly in the structure of the mandibular palp and the first and fifth feet. The basal joint of the mandible-palp is broad, and the two branches short and stout (Pl. XLVIII, fig. 15). The second joint of the inner branch of the second foot is twice as long as the first joint. The basal joint of the fifth foot (fig. 17) is somewhat rounded at the apex, and of moderate width; not much broader than the outer joint. Length $\frac{1}{30}$ th of an inch (.85 mm.).

The following are the localities in which *J. spinulosa* has been noticed:—Westport Bay (Ireland), taken in the tow-net; dredged off Hartlepool on a sandy bottom; and in a depth of thirty-seven fathoms sixteen miles off Hawthorn (Durham), on a muddy bottom; in all cases sparingly.

The resemblance between this and the preceding species is, perhaps, too close to be altogether satisfactory, especially as specimens of the male of *J.*

spinulosa have not been seen; but the points of difference, as shown in the plates, seem to me to be too well marked to allow of the two forms being brought under one specific name.

Genus 12. DELAVALIA, *Brady* (1868).

Delavalia, *Brady*. Nat. Hist. Trans. Northumberland and Durham, vol. iii (1868).

Animal like *Dactylopus* in general form; rostrum short and blunt, abdomen of the female 5-, of the male 6-jointed, tail-segments distant and rather divergent: anterior antennæ shorter than the first body-segment, in the *male* hinged (Plate LI, fig. 3), but destitute of a vesicular swelling, 8-jointed; inner branch of posterior antennæ composed of two or three joints; mandibles well developed, basal joint of the palp large, and giving origin to two long, slender, 1-jointed branches. Maxillar palp well developed, multilobular; first foot-jaw composed of several digitiform segments, a small marginal 2-lobed palp, and a long terminal claw. Second foot-jaw forming a slender clawed hand. All the branches of the four pairs of swimming-feet 3-jointed, except the inner branch of the first pair, which has only two joints. Basal joint of the fifth pair of feet very short and broad, second joint leaf-like, ovate or subovate; ovisacs two, large, and containing a small number of large ova.

1. *DELAVALIA PALUSTRIS*, *Brady*. Pl. L, figs. 1—8.

Delavalia palustris, *Brady*. Nat. Hist. Trans. Northumberland and Durham, vol. iii, p. 134, pl. v, figs. 10—15 (1868).

Rostrum short, broad, somewhat retuse at the apex, and having two minute lateral setæ. Anterior antenna (fig. 2) shorter than the first body-segment, rather densely hairy on the distal half, and devoid of a flagellum: second joint of the posterior antenna (fig. 3) fringed with a series of spine-like hairs on the outer margin; inner branch composed of two long, slender joints. Mandible-palp (fig. 4) large, all the joints long and slender; one of the terminal setæ of the main branch excessively long. First pair of swimming-feet (fig. 6) short, the two branches nearly equal in length; inner branch 2-jointed, the second joint being slender and about twice as long as the first: each branch bears only two slender and moderately long spine-like setæ at its apex. Basal joint of the fifth pair (fig. 8) almost obsolete, terminal joints distant, broadly ovate, the distal extremity fringed with six subequal and not very long setæ. Anal operculum protected by two curved lines of teeth. Caudal segments more than twice as long as broad, distant, and slightly divergent. Inner (or longer) tail seta about as long as the abdomen; outer seta half the length of the inner. Length $\frac{1}{30}$ th of an inch (·85 mm.). Male unknown.

The only locality in which I have as yet found this species is at the mouth of the Seaton Burn, Northum-

berland, where it haunts the shallow pools which are scattered over a small extent of salt marsh near the river side: these pools, being subject to the occasional overflow of the tide, are, of course, brackish, and, towards the end of summer, swarm with microscopic and even larger life of various kinds. I have no doubt that they would well repay a more minute examination than I have been able to devote to them. It may be interesting here to note the Entomostraca which I have taken in this marsh: the Copepoda are *Cyclops æquoreus*, *Tachidius brevicornis*, *Temora velox*, *Delavalia palustris*, *Ectinosoma* (sp.), *Laophonte* (sp.), *Platychelipus littoralis*, *Dactylopus tisboides*, and possibly others of which I have not kept note; and besides these, the following Ostracoda occur plentifully:—*Cythere castanea*, *Limnocythere inopinata*, *Cypris gibba*, *Loxoconcha elliptica*, *Cytheridea torosa*.

As regards the particular species now under consideration—*Delavalia palustris*—it remains to be noted that it is scarce in comparison with the other Copepoda in whose company it occurs, though a few specimens may almost always be found in a gathering from the Seaton Marsh. Though I have dissected several specimens very carefully I have not succeeded in finding the lower foot-jaw; I can scarcely doubt that it really exists, as in other species of the genus, though perhaps very small. The mouth-organs of these mud-loving creatures are very liable to get obscured by adherent dirt, and difficult to recognise even after long-continued maceration in solution of potash.

2. DELAVALIA REFLEXA, *Brady and Robertson*. Pl. LI,
figs. 1—14.

Delavalia reflexa, B. & R. Brit. Assoc. Report, p. 196, 1875.

Anterior antennæ (fig. 2) somewhat more slender than in the preceding species, the last three joints nearly equal in length, third, fourth, and fifth a little larger; both joints of the posterior antennæ (fig. 4) are very long and slender; the inner branch composed of three joints; basal joint of the mandibular palp (fig. 5) very long, giving origin near the middle to a small 1-jointed branch, and at the extremity bearing another long and attenuated 1-jointed branch; both branches setiferous at the apex. Maxillary palp (fig. 6) well developed; first segment of the anterior foot-jaw expanded and crutch-shaped (fig. 7 *a*). Inner branch of the first foot (fig. 9) shorter than the outer, second joint widened at the apex, and only about half as long as the first; inner branches of the third and fourth pairs nearly as long as the outer, that of the second pair (fig. 10) much shorter. Basal joint of the fifth foot in the *female* (fig. 11) short, broad, and bearing four long marginal setæ on the inner segment; second joint (11 *a*) oblong, subquadrate, and having four moderately long terminal setæ; in the *male* the fifth foot is atrophied (fig. 12), the first joint (*a*) having only two setæ and the second (*b*) being reduced to a small unisetiferous lobe. Caudal segments as in *D. palustris*; anal operculum smooth.

Delavalia reflexa was dredged by Mr. D. Robertson and myself five miles off Hartlepool on a sandy bottom; several specimens were taken.

3. *DELAVALIA ROBUSTA*, *Brady and Robertson*. Pl. LI,
figs. 15—21.

Delavalia robusta, B. & R. Brit. Assoc. Report, p. 196 (1875).
Spio brunnea, Idem. Ibidem.

Rostrum as in *D. palustris*; anterior antenna (fig. 15) curved, profusely setose, first joint the longest, fifth shortest. Basal joint of the mandible-palp (fig. 16) of moderate length, branches about equal and nearly as long as the base; palp and digits of the upper foot-jaw (fig. 17) small and simple. Inner branch of the posterior antenna 3-jointed. First pair of feet like those of *D. reflexa*, but that the terminal setæ of the inner branch (fig. 19) are stronger and the principal one plumose; the second, third, and fourth feet have both branches equal (fig. 20), each joint being produced into a strong spine at the distal extremity of the outer margin. Fifth feet like those of *D. reflexa*, but more profusely setose. Caudal segments as in the two preceding species. Length $\frac{1}{30}$ th of an inch (.85 mm.).

This species was dredged in depths of twenty-five to thirty-five fathoms in several places off the coasts of Durham and Yorkshire; off Staiths and Robin Hood's Bay (Yorkshire); and off Hawthorn (Durham); in all these places it occurred very sparingly.

Sub-family 5. CANTHOCAMPTINÆ, nov. sub-fam.

The characters which chiefly distinguish the species belonging to this sub-family are as follow :—The inner branch of the second antenna is usually 1-jointed, and always very small; the mandible-palp consists (usually) of one branch only; the second foot-jaw forms a grasping hand; the inner branch of the first foot is elongated (usually 3-jointed), and more or less adapted for prehension, sometimes, though not always, powerfully clawed, while the fourth pair nearly always, and sometimes also the second and third, have the number of joints in the inner branch reduced to two, or even one. Ovisacs one or two.

The genera which come under this sub-family are *Canthocamptus*, *Mesochra*, *Attheyella*, *Tetragoniceps*, *Diosaccus*, *Laophonte*, *Normanella*, *Cletodes*, and *Enhydrosoma*.

Diagnosis of Genera of Canthocamptinæ.

Mandible-palp	{	un-branch- ed; inner branch of first pair of feet	{	usually elongated, 3-jointed (rarely 2-jointed); inner branch of fourth pair	{	2- or 3-jointed; ovisacs	{	one ... <i>Canthocamptus</i> .
						two ... <i>Diosaccus</i> .		
						composed of one joint only	 <i>Attheyella</i> .
		{	elongated, 2-jointed, bearing at the apex	{	one strong uncinatè claw <i>Laophonte</i> .		
					two or more slender setæ <i>Mesochra</i> .		
					{	shorter than the outer branch, 2-jointed; mandi- ble-palp	{	3-jointed.....
	{	branched; fifth pair of feet	{	minute, or reduced to a few setæ	 <i>Cletodes</i> .		
				{	1-jointed	<i>Tetragoniceps</i> .	
	{	2-jointed			<i>Normanella</i> .		

Genus 13. **CANTHOCAMPTUS**, *Westwood* (1836).

Posterior antenna 2-jointed, and having a small 1- or 2-jointed branch attached to the basal joint; mandible-palp small, composed of one branch; second foot-jaw slender, and forming a prehensile clawed hand. Inner branch of the first pair of feet 3-jointed, elongated, and flexed at the median joint; of the second, third, and fourth pairs 2- or 3-jointed.

1. **CANTHOCAMPTUS MINUTUS** (*Müller*). Pl. XLIV, figs. 1—17.

(Not *C. minutus*. Claus. Die frei-lebenden Copepoden, p. 122.)

Cyclops minutus, O. F. Müller. Zool. Dan. Prodr. (1776). Entomostraca, p. 101, pl. xvii, figs. 1—7 (1785).

Monoculus staphylinus, Jurine. Hist. des Monocles, p. 74, pl. vii, figs. 1—19 (1820).

Cyclopsina — M. Edwards. Nat. Hist. Crust., iii, p. 428 (1840).

Canthocamptus minutus, Lilljeborg. De Crustaceis ex ordinibus tribus, t. xiv, figs. 7—12; t. xv, figs. 13—17; t. xvi, figs. 1—5 (1853).

— — Baird. British Entomostraca, p. 204, t. xxv, figs. 4—8, and t. xxx, fig. 3 (1850).

— — ? Uljanin. Reise in Turkestan (Crustacea), p. 26, pl. vii, figs. 1, 2 (1875).

— *staphylinus*, Frič. Die Krustenthieri Böhmens, p. 224, fig. 21 (1871).

— — Claus. Die frei-lebenden Copepoden, p. 121, pl. xii, figs. 4—14; pl. xiii, figs. 1, 3, 4 (1863).

Female.—Body slender, elongated, not much constricted between thorax and abdomen, straight during

life, but abdomen after death bent to a right or acute angle on the thorax. Head coalescent with first thoracic segment, rostrum short and blunt. Abdomen 4-jointed, the first joint being very large and formed by the fusion of two rings; lower border of each ring finely pectinated; the last joint produced downwards at the dorsal angle into a short spinous process. Anterior antennæ slender, 8-jointed, about as long as the first cephalothoracic segment, all the joints nearly equal in length except the fifth, which is very short, and the last, which is the longest and most slender; the fourth joint has attached to its apex a stout rod-like seta (fig. 2 *a*). The second antenna is moderately long, 2-jointed, and has a small biarticulated branch affixed to the inner margin of the basal joint (fig. 8). The mandible (fig. 4) is stout and bears a small biarticulated palp. The main stem of the maxilla (fig. 5) is divided at the apex into several claw-like segments, and has two lateral lobes, one large and bearing numerous setæ, the other slender and having only one apical claw; on the opposite margin is a small bisetose tubercle. The first foot-jaw is divided at the apex into three claw-bearing segments (fig. 6); the second (fig. 7) is 3-jointed and narrow, the last small and slender, terminating in a long, curved claw, and a small seta. The inner branch of the first foot (fig. 9) is about twice the length of the outer (which reaches only to the apex of its first joint), the second joint is short, and forms at its junction with the preceding a flexile hinge; the last joint, which is long and slender, has at its apex one very long, and two

shorter, setæ, the longer one being geniculated in the middle, and bearing on the distal half a pectinately arranged series of minute cilia; the outer branch has all its joints armed with strong apical spines, between which the external margins are closely ciliated. The second and third pairs of feet have both branches 3-jointed, the inner branches shorter than the outer (fig. 10); inner branch of the fourth foot (fig. 11) short, 2-jointed; basal joint of the fifth pair (fig. 15) broad, the inner segment scarcely at all elongated, but bearing five, stout, shortly-plumose setæ; second joint ovate, narrow, provided with one long apical and three marginal setæ, all of which are plumose, the inner margin has also two much shorter setæ. Tail-segments (fig. 17) not much longer than broad, bearing two apical setæ, the innermost of which is at least three times longer than the outer, and is minutely aculeate along the margins; anal operculum (fig. 17 *a*) denticulated. Length $\frac{1}{32}$ nd of an inch (1.1 mm.).

Male.—Anterior antenna (fig. 3) constricted so as to form a hinge between the fifth and sixth joints; thickly beset with short marginal hairs. The second and third joints of the inner branch of the second foot are incompletely separated (fig. 12), and the apical setæ are much reduced in size; in the third foot the inner margin of the second joint is produced into a long, downward-pointing, spinous process (fig. 13), while the third joint has only a single small apical seta, all the other setæ of the branch being wanting; the joints of the fourth foot present the same characters as in the female, except that the marginal setæ of the

inner branch (fig. 14) are reduced in size, and the small outer apical seta (*a*) is thickened and spine-like. The basal joint of the fifth foot (fig. 16) has only two principal spines on its inner segment. Abdomen composed of five segments.

This pretty and graceful species occurs commonly in small freshwater pools and ponds throughout the country. I have no record of its occurrence at any great elevation, nor have I ever found it in lakes or very large sheets of water. The reason of this I take to be that it prefers shallow water where the vegetation is abundant; its colour seems to vary with the character of the plants and Infusoria upon which it probably feeds. The only considerable pieces of water in which I have found it are the lake in Axwell Park near Gateshead, and Holy Island Lough (Northumberland), but both these are really, as to size and character of vegetation, big ponds rather than lakes.

Müller's figures of *Cyclops minutus*, though in some respects inaccurate, as was unavoidable in the absence of the modern microscope, doubtless refer to the species under consideration. Jurine, however, discarded the name *minutus*, under the idea that still smaller species of the genus might subsequently be found, a reason which might have had some weight had Müller called his animal *minutissimus*, but to which we can scarcely allow any, as matters stand. It seems to me due to the older author to retain his specific name which has the claim of undoubted priority.

The females are very commonly found with a long, narrow, and curved spermatheca attached to the

vulvar aperture of the first abdominal ring. There appears never to be more than one of these tubes attached to the same female, whereas in the case of *Temora* and *Diaptomus* several of the spermatophores may be seen depending side by side from the vulva of the same individual. This difference, together with the peculiarly hard and rigid character of the attached body in the case of *Canthocamptus*, has induced Dr. Baird and other authors to doubt the spermatic nature of the tubes. I think, however, there need be no doubt on the matter; the tubes may indeed be seen in the interior of the male organism before their extrusion, just as is constantly noticed in the males of other Copepods.

2. *CANTHOCAMPTUS HIBERNICUS*, *nov. sp.* Pl. XLVI,
figs. 1—12.

Anterior antenna (Pl. XLVI, fig. 3) of the female slender, 8-jointed, about as long as the first body-segment, and much like that of the preceding species. Inner branch of the second antenna (fig. 4) very small, 1-jointed. Posterior foot-jaw (fig. 7) having a broad hand armed with a long apical claw. Inner branch of the first pair of feet (fig. 8) scarcely twice as long as the outer; first joint longer than the entire outer branch, and nearly twice as long as the united second and third joints, both of which are extremely small. Inner branches of the second, third, and fourth pairs shorter than the outer, and 3-jointed, the first joint being very

small (fig. 9). Inner segment of the basal joint of the fifth pair of feet (fig. 10) in the *female*, elongated, fringed, bearing two long and three short apical setæ; second or outer joint sub-ovate, finely fringed internally; externally bearing six long marginal setæ. In the *male* the limb is smaller, the basal joint short, broad, and having six short setæ of equal length (fig. 11); second joint nearly like that of the female. Caudal segments (fig. 12) somewhat longer than broad; inner seta about twice as long as the outer; anal operculum denticulated. Length $\frac{1}{40}$ th of an inch (.65 mm.).

C. hibernicus occurs plentifully in the Mullingar Canal at Dublin, and in a lake near Newport, county Mayo; for specimens from both of these places I am indebted to my friend Mr. David Robertson, of Glasgow. From *C. minutus*, which must be considered as the type of the genus, it differs essentially in having the inner branch of the fourth foot 3-jointed; but in all other important particulars its characters are those of a true *Canthocamptus*.

3. CANTHOCAMPTUS PALUSTRIS, *nov. sp.* Pl. XXXIX,
figs. 13—23.

Anterior antenna of the *female* slender, 8-jointed; second joint the largest; last two much more slender than the rest (fig. 13). In the *male* it is more robust, the fifth and sixth joints coalescent (fig. 14), and forming

a vesiculiform swelling, the last joint hooked. Accessory branch of posterior antenna (fig. 15) very small, biarticulate; mandible-palp (fig. 16) small, biarticulate, unbranched, and bearing four small setæ. First foot-jaw (fig. 17) divided into four setiferous segments; second small (fig. 18) and forming a clawed hand. The first four pairs of feet have both branches 3-jointed; the inner branch of the first pair (fig. 19) is rather longer than the outer, its first joint being as long as the second and third together, and having a long seta and three or four small hairs on its inner margin; the inner branches of the second, third, and fourth pairs are considerably longer than the outer, and the outer margins of all are fringed with spine-like hairs; the third and fourth pairs longer than the first two. Fifth pair in the *female* (fig. 21) 2-jointed, the basal joint short and broad, its inner segment fringed with three short, equal spines, and two longer ones, besides numerous short hairs; the second joint is sub-ovate, fringed with fine hairs and having five long apical setæ. In the *male* (fig. 22) the fifth pair is obsolete, being reduced to a minute setiferous lobe. Caudal segments very short, bearing two principal setæ, the outer half as long as the inner. Length $\frac{1}{37}$ th of an inch (.9 mm).

This is a brackish-water species inhabiting the same sort of localities as *Tachidius brevicornis*, from which, however, it is perfectly distinct. I have taken it in a large pond, subject to occasional tidal influx, at St. Mary's (Scilly); in brackish pools by the River Stour, at Manningtree, and in Oulton Broad (Suffolk); it

occurs also in a brackish-water gathering taken by the Rev. A. M. Norman at Isle Oronsay, Skye.

It may be readily distinguished at sight from *Tachidius* by its somewhat greater size, and more slender and graceful figure, as well as by the longer antennæ.

4. *CANTHOCAMPTUS TRISPINOSUS*, *nov. sp.* Pl. XLV,
figs. 15—22.

Anterior antenna 9-jointed (fig. 15), slender, the last joint very small, third and sixth long, fifth short, bearing numerous rather short hairs; inner branch of the posterior antenna small, 1-jointed. Mandible-palp minute. Lower foot-jaw moderately strong (fig. 19), second joint having two slender spines on the external margin. First pair of feet exactly like those of *Canthocamptus minutus*. Inner branches of the second, third, and fourth pairs short, 2-jointed (fig. 20), the first joint very small, the second elongated. Basal joint of the fifth foot of the *female* (fig. 21) not at all produced downwards, bearing three strong plumose setæ and a fringe of several minute cilia on the inner margin; second joint long and narrow, internal margin densely fringed with small hairs, external corrugated and bearded; one long and two shorter apical setæ, and two on the external margin, all of which are strongly ciliated. The segments of the abdomen, except the last, are finely denticulated along the posterior margins (fig. 22); anal operculum smooth;

caudal segments about as long as broad, bearing three stout marginal spines, and two plumose apical setæ. Length $\frac{1}{35}$ th of an inch (1 mm.). Male unknown.

The only known locality for this species is the river Nene at Peterborough, where I took it sparingly in a little weedy inlet.

This, and the following species, *C. Northumbricus*, constitute a link between the two genera *Canthocamptus* and *Mesochra*, the first foot being similar in structure to the typical *Canthocamptus*, having both its branches triarticulate, while the remaining pairs of swimming-feet have the inner branch biarticulate after the manner of *Mesochra*. It seems better, however, to enlarge the generic definition so as to include these forms, rather than to erect a new genus for their reception, which would indeed, if the same principle were fully carried out, necessitate the establishment of not one but several new genera. The point on which I base the separation of *Canthocamptus* from *Mesochra* is the structure of the first foot, leaving altogether out of sight the number of joints of which the three following pairs are made up.

The most important specific characters of *C. trispinosus* are found in the structure of the fifth pair of feet, the very slender 9-jointed anterior antenna, and the three spines of the caudal segments.

5. CANTHOCAMPTUS NORTHUMBRICUS, *nov. sp.* Pl. XLV,
figs. 1—14.

Body robust; abdomen of the female 4-, of the male 5-jointed. Anterior antenna (fig. 1) as long as the first segment of the body, 9-jointed, almost exactly similar to that of *C. trispinosus*. Secondary branch of the posterior antenna very small, 1-jointed. Mandible (fig. 4) very slender, palp minute. Second foot-jaw and first pair of feet (figs. 7 and 8) as in *C. trispinosus*. Inner branches of second, third, and fourth pairs of feet 2-jointed (fig. 9), the first joint very small. In the *male* the inner branch of the third foot (fig. 11) is 3-jointed, and the middle joint is produced downwards into a long crooked spine; the last joint has three apical setæ. Basal joint of the fifth foot in the *female* broad, the inner segment not at all produced, but fringed with six stout plumose setæ; second joint broad, quadrangular (fig. 12), and armed with five stout plumose setæ, one of which is much longer than the rest; in the *male* the inner segment of the basal joint (fig. 13) has only three setæ; the second joint small, subtriangular, and having a setose armature somewhat similar to that of the female. The hinder margins of the abdominal segments (fig. 14) are serrated with two rows of small teeth, and the anal operculum is also sparingly denticulated (fig. 14 *a*). Length $\frac{1}{8}$ th of an inch (.9 mm.).

This species I have found only sparingly in the lake at Bolam, Northumberland.

Genus 14. ATHEYELLA, nov. gen.

Like *Canthocamptus*, except that the inner branch of the first pair of feet is scarcely at all elongated, and is either 2- or 3-jointed; those of the second and third pairs are 1- or 2-jointed, the first joint being very small; and that of the fourth pair consists of only one joint.

1. ATHEYELLA SPINOSA, nov. sp. Pl. XLIII, figs. 15—18; and Pl. XLVI, figs. 13—18.

Female.—Anterior antenna (Pl. XLIII, fig. 15) 8-jointed, joints subequal, fifth and seventh the smallest, sparingly setose; secondary branch of posterior antenna small (Pl. XLVI, fig. 13), 1-jointed. First joint of inner branch of first foot (Pl. XLIII, fig. 17) about as long as the united lengths of the last two joints; second and third joints nearly equal. Inner branches of the three following pairs (Pl. XLVI, figs. 15, 16) very short. Basal joint of fifth pair (Pl. XLIII, fig. 18, and Pl. XLVI, fig. 17) very broad; inner segment produced, and bearing five or six very long curled setæ; second joint narrow, and armed with a few setæ, two of which are very long. The abdominal rings are fringed posteriorly with closely-set, long, spine-like setæ (Plate XLVI, fig. 18); the principal tail setæ are rather short and divergent, thick, and

twisted at the base, and the larger pair are shortly plumose. Length $\frac{1}{3}$ rd of an inch (.77 mm.).

Male unknown.

A very few specimens only were found in an old engine-pond at Murton Junction, near Sunderland; and a single example, which appears to belong to the same species, occurred in a gathering sent to me by Mr. David Robertson from an old canal at Peterhead. The fifth foot of this latter specimen is represented at Pl. XLIII, fig. 18, and differs slightly from that of the Murton specimens. More recently (July, 1877) I have found *A. spinosa* in a gathering taken amongst weeds in the river a little west of Pwllheli, Caernarvonshire, a situation where it is quite possible that sometimes the water may become brackish, though at the time of my visit it was not perceptibly so. I at first supposed these specimens to belong to Fischer's *Canthocamptus horridus*, to which they bear a very close resemblance, but Fischer's figure distinctly represents the first foot with a much elongated inner branch, from which I infer that it cannot be identical with the present species, which seems to be generically distinct from *Canthocamptus*. I propose, therefore, for its reception a new genus named after my friend Mr. Thomas Atthey, of Gosforth, near Newcastle, to whom we are indebted for the discovery of the next species (*A. cryptorum*), and who, by his intelligent and unwearying labours amongst the fossils of the Northumberland coal-field, together with an unsurpassed manual skill in the preparation of his specimens, has done so much for that branch of science.

2. *ATTHEYELLA CRYPTORUM*, *Brady*. Pl. LII, figs. 1—18.

Canthocamptus cryptorum, *Brady*. *Journal of Microscopical Science*, vol. ix, pl. vi, figs. 1—10 (1868).

Animal slender, about $\frac{1}{4\frac{1}{2}}$ th of an inch in length; head united with the first thoracic segment; posterior borders of all the body-rings finely pectinated. Anterior antennæ 8-jointed, shorter than the first body-segment (fig. 2), the joints not much differing in length; the fifth joint in the *male* much swollen (fig. 3). Mandible-palp (? absent). Inner branch of the posterior antennæ 2-jointed. Posterior foot-jaw (fig. 8) slender, the hand finely ciliated on the inner margin, and terminating in a long, slender, and slightly curved claw. Branches of the first pair of swimming-feet (fig. 9) equal, spinous on the outer margins, the apical spines of each joint very long; inner branch 2-jointed, the second joint slender and nearly twice as long as the first. Inner branch of the second pair of feet (fig. 10) only half as long as the outer, the first joint only about one fourth the length of the second, which bears two long apical setæ, four shorter setæ on the outer and one on the inner margin; inner branch of the fourth foot (fig. 11) small, 1-jointed, fringed with three long and three short setæ. The inner branch of the third pair (fig. 12) is 1-jointed, tapering, and ends in an extremely long, plumose seta, at either side of which is a short spine and another plumose seta of

little more than half the length. The basal portion of the fifth foot is large (fig. 16), its inner portion quadrilateral, the distal margin bearing six stout, plumose, and unequal setæ; the second joint small, ovate, reaching as far as the extremity of the first joint, bearing one long and four shorter setæ. In the *male* the inner branch of the second foot (fig. 13) is modified, having a long, flexuous, lateral spine, while that of the third foot (fig. 14) is much attenuated, and of the fourth (fig. 15) quite rudimentary. The fifth pair (fig. 17) is much smaller, and has also a smaller number of setæ. The anal operculum (fig. 18) is strongly spinous along its curved posterior margin. The caudal segments are short and broad, and the innermost or longest seta is more than half the length of the body of the animal. Eyes absent.

This little animal inhabits the damp roof of the pit-workings of the low main, West Cramlington Colliery, near Newcastle, living amongst films of gelatinous algæ. Specimens, both living and dead, were kindly sent to me by Mr. Atthey, but I was not able to detect any eyes; nor even with the most careful dissection have I succeeded in getting a view of the mandible-palp, the existence of which, however, I can scarcely doubt. Apart from peculiarities of structure, the species has a distinct interest on account of its unusual habitat; there can be no doubt, however, that similar situations, if minutely searched, would disclose unsuspected forms of microscopic life. I have, indeed, in this same gathering seen a species

of *Cyclops* (?), which I have not been able to identify or describe from want of sufficient material.

Genus 15. MESOCHRA, Boeck (1864).

(*Paratachidius*, Brady & Robertson, 1873.)

First pair of antennæ 7- or 8-jointed; inner branch of the second pair small, 1- or 2-jointed. Mandible-palp of one branch. Inner branch of the first pair of feet 2-jointed, the first joint being usually much elongated, the second and third coalescent; outer branch shorter, 3-jointed. Inner branch of the second, third, and fourth pairs 2-jointed, short.

There is nothing to distinguish *Mesochra* from the genus *Canthocamptus* excepting the structure of the swimming-feet, the inner branches of which are constantly 2-jointed.

1. MESOCHRA LILLJEBORGII, Boeck. Pl. XLI, figs. 15—21; and Pl. XLVII, figs. 16—21.

Mesochra Lilljeborgii, Boeck. Oversigt Norges Copepoder, p. 51 (1864).

Paratachidius gracilis, B. & R. Ann. and Mag. Nat. Hist., ser. iv, vol. xii, p. 131, pl. viii, figs 8—16 (1873).

Rostrum large, longer than the first joint of the anterior antenna; head united with the first thoracic segment; first four abdominal rings bordered behind

with rows of thickly set, short spines (Pl. XLI, fig. 21), last segment short and destitute of spines, caudal segments a little longer than broad. Anterior antenna of the *female* short, the joints of nearly equal size, the third and fourth being, however, slightly longer than the rest (Pl. XLI, fig. 15). In the *male* the anterior antenna is short and thick (fig. 16), corrugated and obtuse, ending in a small aborted claw. Posterior antenna 2-jointed (fig. 17), and having a very small 1-jointed branch attached to the middle of the inner margin of the first joint. Second pair of foot-jaws (fig. 19) small, terminal claw long and slender. First joint of inner branch of first pair of feet (Pl. XLVII, fig. 17) longer than the entire outer branch, with ciliated margins, and bearing below the middle of the inner margin a moderately long seta; last joint (coalescent second and third joints, Boeck) short, and armed with two long and strong apical setæ; the three joints of the outer branch with strong apical spines and fringed margins, middle joint fringed also on the inner margin, the three terminal setæ of last joint geniculated. First joint of the inner branch in the three following pairs of feet not very much smaller than the second joint (Pl. XLVII, figs. 18—20). Inner segment of the basal joint of fifth pair long and broad (fig. 21), and having six stout setæ of various lengths; second joint rather small, sub-quadrangular, and bearing five setæ, the longest of which are plumose. In the *male* the fifth foot is much smaller (Pl. XLI, fig. 20), and the inner segment of the basal joint has only three setæ. The anal operculum is

devoid of spines. Inner tail seta twice as long as the outer, and about equal in length to the abdomen. The inner branches of the swimming-feet in the male do not greatly differ from those of the female. Length $\frac{1}{33}$ rd of an inch (.77 mm.).

The localities in which I have met with this species are few, but in these it occurs pretty plentifully; in a brackish tidal pond at Westport (Mayo); in a pool just above high-water mark, and in ditches amongst *Utricularia minor*, near Clifden (Galway); also in brackish pools at Pensarn, Merionethshire.

2. *MESOCHEA ROBERTSONI*, *nov. sp.* Pl. XLVII, figs. 1—15.

Animal robust; abdomen not much more slender than the thorax, in the female 4-jointed, the last joint short, and forming a projecting process at the posterior dorsal angle; caudal segments scarcely as long as broad; anal operculum strongly denticulated (fig. 15). Anterior antenna much shorter than the first body-segment, slender, 8-jointed (fig. 2), the joints nearly equal in length; accessory branch of the posterior antenna small, 2-jointed. Posterior foot-jaw (fig. 6) small and slender. First pair of feet (figs. 7, 8) very small, larger in the male; inner branch composed of two nearly equal joints, and only slightly longer than the outer branch; inner branches of the second, third, and fourth pairs (figs. 9, 10, 11) short, the first joint extremely small. Basal joint of the fifth pair very

broad, the internal segment much produced (fig. 12), and bearing four long and two short setæ, the longer ones plumose; second joint small, ovate, and having one long and several small marginal setæ; the basal joint in the *male* (fig. 13) is not much produced, and has only two spine-like setæ. The longer of the two principal tail setæ is a little longer than the abdomen, the other about half as long; both are minutely plumose. Length $\frac{1}{8}\frac{1}{7}$ th of an inch (.68 mm.).

This I know only from Irish specimens. It occurred in gatherings taken by Mr. Robertson and myself in Lough Enask and Lough Arddery (two of the small lakes of Connemara), and abundantly in a brackish ditch near Newport, Co. Mayo, Ireland, where it was found by Mr. Robertson, after whom I have much pleasure in naming it.

Genus 16. TETRAGONICEPS, nov. gen.

Animal elongated, cylindrical; head consolidated with thorax; abdomen elongated. Anterior antennæ 8-jointed, slender; posterior long, 3-jointed, with a small 1-jointed inner branch. Mandible-palp slender, 2-branched; maxillar palp moderately developed; second foot-jaw forming a prehensile clawed hand. Inner branch of first pair of feet elongated, 2-jointed, outer 3-jointed; second, third, and fourth pairs with the outer branch long and 3-jointed, the inner branch 2-jointed; fifth pair 1-branched.

This genus is well characterised by the very long

triarticulate posterior antenna, the presence of a small branch on the mandible-palp, the uniformly triarticulate outer and biarticulate inner branches of the swimming-feet, and by the one branched fifth foot.

1. TETRAGONICEPS MALLEOLATA, *nov. sp.* Pl. LXXVIII, figs. 1—11.

First segment very broad and subtruncate in front, rostrum short; abdomen nearly as stout and quite as long as the cephalothorax, 5-jointed, first joint shortest, last longest; caudal segments slender, as long as the last abdominal segment. Anterior antenna (fig. 2) slender, somewhat longer than the first cephalothoracic segment, 8-jointed; first joint as long as the united lengths of the following five, and produced at the inner apical angle into a large and stout curved prominence somewhat like the claw of a hammer; second joint about half as long as the first, the following being the relative lengths of the several joints, 14, 8, 4, 5, 2, 3, 3, 4; posterior antenna (fig. 3) composed of three elongated, nearly equal joints, to the first of which is attached a small, slender, 1-jointed branch; the terminal setæ are slender and are attached almost wholly to the apex. The hand of the second foot-jaw (fig. 7) is slender, and has a long slender apical claw. First joint of the inner branch of the first foot slender (fig. 8), longer than the entire outer branch, and having a single plumose seta on its inner margin, second joint short, and bearing two short

apical setæ; inner branch of the second and third pairs (fig. 9) not very much shorter than the outer branch, that of the fourth pair (fig. 10) less than half as long; except a small, weak spine at the apex of each joint of the outer branch, the feet are entirely without spinous appendages; each branch, however, bears three apical setæ, and the first joint of the inner and the second of the outer branch have each one seta. The fifth foot (fig. 11) is very large, consisting of a single long, somewhat sternum-shaped joint, broad at the base, then suddenly constricted and tapering abruptly to the pointed apex; three or four marginal setæ on the basal portion, and one towards the apex. The caudal setæ are short, the longest being shorter than the abdomen. Length $\frac{1}{8}$ th of an inch (.9 mm.).

Three specimens only of this interesting species were found amongst dredged material from a depth of twelve fathoms inside St. Agnes (Scilly Islands). Its characters are so remarkable as to need no comment. The generic name *Tetragoniceps* was applied first in MS. to this species, but afterwards erroneously to *Laophonte thoracica* * ("*Tetragoniceps longiremis*"). So far as this latter species is concerned, the new generic name necessarily lapses.

* Brady and Robertson, 'Brit. Assoc. Report,' 1875, p. 196.

Genus 17. DIOSACCUS, Boeck (1872).

Anterior antenna 8-jointed, the peduncle (first four joints) very long, flagellum (last four joints) short. Inner branch of the posterior antenna 1- or 2-jointed. Mandible-palp simple, 2-jointed. Outer branch of the first foot very short, 3-jointed; inner branch 3-jointed, first joint much elongated, second and third extremely short; second, third, and fourth pairs having both branches 3-jointed, except that the inner branch of the second pair in the male is 2-jointed; ovisacs two.

It is perhaps doubtful whether the characters of this genus are such as to warrant its separation from *Dactylopus*, the most important diagnostic marks being the elongated peduncle of the upper antenna, the 1-branched mandible-palp, and the double ovisac. The only British species is *Diosaccus tenuicornis*, but M. Boeck has described a second species from Norway, under the name of *D. abyssi*.

1. *DIOSACCUS TENUICORNIS*, *Claus.* Pl. LIX, figs. 12—16,
and Pl. LX, figs. 14—18.

Dactylopus tenuicornis, *Claus.* Die frei-lebenden Copepoden, p. 127, t. xvi, figs. 17—23 (1863). Copepoden Fauna von Nizza, p. 28, t. iii, figs. 17—19 (1866).

Nitokra — B. & R. Ann. and Mag. Nat. Hist., ser. iv, vol. xii, p. 137 (1873).

Body slender, elongated, head united with first thoracic segment, and produced into a long curved beak (Pl.

LX, fig. 14). Anterior antennæ slender; in the *female* the first four joints are unitedly three times as long as the following four, and somewhat sparingly setose. Posterior antennæ (Pl. LIX, fig. 13) large, 2-jointed, the joints slender and nearly equal; a small 1-jointed secondary branch springing from the middle of the first joint. Mandible (fig. 14) short and stout, palp short, 2-jointed. The hand of the second foot-jaw (Pl. LX, fig. 16) is pear-shaped, swollen towards the base, and fringed along the middle of the inner margin with a number of short cilia; terminal claw 2-jointed and much curved. Outer branch of the first foot (fig. 17) half the length of the first joint of the inner branch. Inner branch of the second foot of the *male* (Pl. LIX, fig. 15) short, 2-jointed, the third joint giving place to two spines and a long seta. Fifth pair of feet 2-jointed; in the *female* (Pl. LX, fig. 18) the joints are nearly equal in size, elongated, subquadrate, each bearing five short setæ, the larger of which are spine-like and plumose; in the *male* (Pl. LIX, fig. 16) the joints are much reduced in length and bear fewer setæ. Caudal segments short, the outer tail seta about one third as long as the inner. Length, $\frac{1}{2}\frac{1}{5}$ th of an inch (1 mm.).

This is an exceedingly distinct and graceful species, and is in general easily recognised by its long, curved antennæ, and by the pyriform palm of the lower foot-jaw; it often occurs in considerable abundance. I have notes of its capture in the following places:—In surface-net, Westport and Roundstone Bays (abundant in the last-named locality); on *Laminariæ*, Clifden Bay;

on weeds at low-water-mark, St. Mary's, Scilly; in surface-net at Cumbræ (Firth of Clyde); dredged in fifteen fathoms, Portincross (Ayrshire); on weeds at Hillswick, Shetland (*Rev. A. M. Norman*).

Genus 18. LAOPHONTE, Philippi (1840).

(*Laophonte*, Philippi, Archiv für Naturgeschichte, 1840. *Cleta*, Claus, Die frei-lebenden Copepoden, 1863. *Asellopsis*, B. & R., Ann. and Mag. Nat. Hist., 1873.)

Body elongated, slender, hinder margins of the segments usually fringed with fine teeth or serratures. Anterior antennæ 4—8-jointed; secondary branch of the posterior pair small, 1-jointed. Mandible-palp small, 1-jointed, or with a rudimentary second branch. Maxillæ strongly aculeate and provided with a well-developed digitate palp. First pair of foot-jaws strong, subtriangular, with three or four setiferous marginal digits; second pair forming a slender clawed hand. First pair of feet elongated, slender; outer branch not more than half the length of the inner, composed of two or three joints and terminating in two or three slender setæ; inner branch elongated, 2-jointed; the first joint excessively long, second short and bearing a long movable claw at the apex. The second, third, and fourth pairs have the outer branch composed of three, the inner of two joints, except in some cases where the inner branches of the second and third pairs in the male are *three*-jointed and formed as in *Harpacticus*.

The fifth pair has a very large basal joint, the internal segment of which (and sometimes also the outer) is usually much produced; second joint smaller and ovate. In the *male* the fifth pair is much smaller than in the female.

This genus in anatomical structure, though not in general appearance, very closely resembles *Mesochra*, Boeck, but differs in the poorly developed mandible-palp, and the strongly clawed inner branch of the first pair of feet. The serrated or denticulated posterior margin of the body-segments and the rigid, angular build of the animal likewise furnish good distinctive characters. The species called by Philippi (*loc. cit.*) *Laophonte* is, I think, undoubtedly identical generically with those assigned by Claus to the genus *Cleta*, and of course has the claim of priority as to nomenclature. *Asellopsis hispidus* (*loc. cit.*), though very abnormal in general appearance, seems to have no special point of structure calling for generic separation.

1. LAOPHONTE SERRATA, Claus, Pl. LXXIII, figs. 1—14.

Cleta serrata, Claus. Die frei-lebenden Copepoden, p. 123, t. xv, figs. 13—20 (1863).

Body elongated; the first segment almost square when viewed laterally, produced into a rostrum of moderate size, and about equal in length to the three following segments; each segment considerably overlaps the next one, forming a prominent dorsal angle; the fifth and sixth segments are constricted and the

seventh is again more prominent and convex dorsally ; the last abdominal segment has a sharp spine at the postero-dorsal angle. The second, third, and fourth segments are sometimes deeply tinged with purplish or bluish black. The *male* (fig. 2) has a strongly gibbous thorax, the outline of the animal when seen laterally being not unlike a note of interrogation (?).

Anterior antenna 4-jointed (fig. 3), in the *female* the third joint is the longest, the first joint has two small spines, and the second, one very large and stout spine, while the third and longest joint bears a row of several small denticulations on the under margin ; the distal half of the antenna is densely setose. In the *male* (fig. 4) the same spines appear, but that of the second joint is not so strongly developed ; the fourth joint forms a vesiculiform swelling, and the limb is clawed at the apex. The inner branch of the posterior antenna is attached to the middle of the first joint (fig. 5), is very small, 1-jointed, and bears four setæ. The mandible (fig. 6) is small, bluntly toothed at the apex, and has a small 1-jointed palp to which are attached four setæ. The posterior foot-jaw (fig. 8) is slender, having an elongated subtriangular hand and a long slender claw, which is quite as long as the hand itself. The peduncle of the first pair of feet (fig. 9) is 2-jointed, the outer branch very slender, 3- or sometimes 2-jointed (the last two joints being often coalescent) and only half as long as the first joint of the inner branch ; the inner branch is very stout, and armed with a strong falcate terminal claw. The second, third, and fourth pairs have the outer branch (fig. 10)

long and slender, the inner branch only about half as long. The second pair in the *male* (fig. 11) is 3-jointed, the last joint being armed with a slender curved spine and four long setæ. The fifth pair in the *female* (fig. 12) has a very large triangular basal joint which is often distinctly areolated, and has four long sub-apical setæ; the second joint is large and ovate and attached by a narrow neck near the outer angle of the first joint; it is densely ciliated round the margins and has six stout setæ externally. In the *male* (fig. 13) the foot is much smaller, the basal joint scarcely at all produced and bearing one external and two internal setæ; the second joint small, angular, and 4-setose. The caudal segments (fig. 14) are distant, moderately slender, and about as long as the last abdominal segment; they bear a single stout apical seta, about equal in length to the abdomen, and two short lateral ones. Length $\frac{1}{8}$ th of an inch (.9 mm.).

This is by no means a common species. Mr. Robertson and I dredged a few specimens in a depth of ten to twelve fathoms off St. Agnes (Scilly), and likewise took a few amongst weeds at St. Mary's; we have also taken it in Clew Bay, and at the roots of weeds in Roundstone and Mulroy Bays. I have specimens dredged by Mr. E. C. Davison in Ventry Bay. These are all the British localities known to me, and the species would seem, therefore, to be distributed chiefly, if not entirely, on our western shores. As Dr. Claus's specimens, however, were taken at Heli-goland, it is probable enough that it may be found also upon the east coast of Britain.

2. LAOPHONTE HORRIDA, *Norman*. Pl. LXXIV, figs.
1—11.

Cleta minuticornis, Buchholz. Die zweite deutsche Nordpolar-
fahrt in den Jahren 1869 und 1870, p. 393,
pl. xv, fig. 3.

— *horrida*, *Norman*. Report of the "Valorous" Expedition,
p. 206 (Proceedings of the Royal Society), 1876.

Female. — Body elongated; head separate from thorax; rostrum long and sharp; dorsum strongly jagged and spinous; as seen from behind, rounded with two sharp lateral angles (figs. 1, 2), the cephalic segment being produced in the median line into one very large backward projecting spine (figs. 1 and 2), the thoracic and first two abdominal segments each having two spines; first and second abdominal segments produced also into lateral angular spines and marginally ciliated; posterior margins of the segments denticulated (fig. 11); caudal segments about twice as long as broad, rather longer than the last abdominal segment, carrying one stout apical seta about two thirds the length of the body, one much smaller and very slender, and three very small external lateral setæ near the apex. Anterior antennæ slender, longer than the cephalic segment, 6-jointed, second and third joints long and nearly equal, last three joints short; the comparative lengths being as follows:

1.	2.	3.	4.	5.	6.
7	9	7	2	2	3

Second foot-jaw (fig. 7), long and slender, hand elongated and scarcely at all dilated. First pair of feet

(fig. 8) very long, with a long and slender 2-jointed peduncle, the margins of which are densely ciliated; outer scarcely one third as long as the first joint of the inner branch; inner branch stout and strongly clawed. Second, third, and fourth pairs shorter, slender, outer branches about twice as long as the inner, densely ciliated on the external margins; apical spine of each joint very long and pectinated on the edges; first joint of inner branches very short, second long and slender. Basal joint of the fifth foot very large (fig. 10); segments much elongated, the outer bearing one, the inner four long setæ. Length $\frac{1}{20}$ th of an inch (1.3 mm.).

This remarkable and strongly characterized species has been noticed in Britain as yet only on the Atlantic coasts of Scotland and the north of Ireland, but was found also by the German Polar Expedition in the Arctic Sea. Buchholz, in his account of the Zoology of that Expedition, refers it to *Cyclops minuticornis*, Müller, an identification which certainly cannot be accepted, and Mr. Norman in his report on the Crustacea, &c., of the "Valorous" cruise, proposed for it the specific name *horrida*, a term which I had also myself previously applied to it, though only in MS. My collection contains several specimens which were dredged off the Island of Cumbrae amongst vegetable and other *débris*, and one from a depth of fifteen fathoms off Portincross (Ayrshire). Mr. Norman found a single example in material from Oban, and, lastly, I have noticed it in material washed from the roots and fronds of *Laminariæ* in Mulroy Lough,

Donegal. Female specimens only have been observed.

3. LAOPHONTE THORACICA, Boeck. Pl. LXXVII, figs. 1
—8.

Laophonte thoracica, Boeck. Oversigt Norges Copepoder, p. 54
(1863).

Tetragoniceps longiremis, B. & R. Brit. Assoc. Report, p. 196,
(1875).

Female.—Body elongated (fig. 1), subsigmoid when seen laterally, posterior dorsal angles distinctly but not very strongly prominent, margins denticulated; head united with the first thoracic segment, no rostrum; caudal segments very slender, distant, about twice as long as the last abdominal ring; principal tail seta rather longer than the abdomen; second abdominal segment (fig. 8) produced laterally, the angles rounded and densely ciliated; third segment (fig. 8) also produced, but angulated and armed with two lateral spines; fourth segment not produced, setose at the angle. Anterior antennæ (fig. 2) slender, about as long as the cephalic segment, 6-jointed, the joints having the following proportionate lengths :

$$\begin{array}{cccccc} 1, & 2, & 3, & 4, & 5, & 6. \\ 8 & 11 & 8 & 1\frac{1}{2} & 1\frac{1}{2} & 5 \end{array}$$

Secondary branch of posterior antenna (fig. 3) very small, 4-setose. Second foot-jaw (fig. 4) excessively long and slender, the hand almost linear and the terminal claw very long. First pair of feet (fig. 5) very long, peduncle long, slender, and biarticulate;

external branch very slender, less than half the length of first joint of outer branch; outer branch long and moderately stout, with a long curved claw. Second, third, and fourth pairs very slender, elongated (fig. 6), outer branch twice as long as the inner, the last joint as long as the preceding two. Fifth pair of feet (fig. 7) long and narrow; lateral segments of the basal joint not much developed; inner segment 4-, outer 1-setose, second joint attenuated, with ciliated margins; the apex bearing two, and the outer margin three, long setæ. Length $\frac{1}{4}$ th of an inch (.52 mm.).

Apparently a rare species. Two or three specimens only were seen in dredged material from a depth of thirty fathoms, off Staiths and Robin Hood's Bay, Yorkshire coast: one or two specimens, perhaps referable to *L. thoracica*, occur in a series of Copepoda taken by Mr. Norman at Oban, in a depth of twelve to sixteen fathoms. The characters of the antennæ, second foot-jaws, and fifth pair of feet amply distinguish it from any other species. I am indebted to the kindness of the late M. Boeck for drawings of *L. thoracica*, and can scarcely entertain any doubt that they refer to the species here described, though the swimming-feet of the Norwegian species do not appear in M. Boeck's figures to be quite so slender, nor the fifth pair of feet so profusely setose; this last condition, however, may very easily have arisen from accidental mutilation. Females only have occurred amongst my specimens.

4. LAOPHONTE SIMILIS, *Claus.* Pl. LXXV, figs. 1—14.

Cleta similis, Claus. Die Copepoden-Fauna von Nizza, p. 23, t. v, figs. 13, 14 (1866).

? — *forcipata*, Norman. Last Shetland Dredging Report, p. 296 (1868).

Body slender (fig. 1); head rounded in front and united with the first thoracic segment, dorsal angles of the segments not produced, posterior margins finely aculeate; caudal segments about twice and a half as long as broad, and longer than the last abdominal joint; setæ finely ciliated, the inner one about as long as the entire animal, the outer less than half as long. Anterior antennæ (fig. 2) 8-jointed, the first three joints long, the rest short and subequal; in the *male* the fourth joint forms a corrugated, pear-shaped swelling (fig. 4), the last two joints being slender, and together making a strongly curved claw. The mandible-palp is very small (fig. 5), but has a minute lateral branch. The hand of the posterior foot-jaw (fig. 8) is convex on the outer margin, and moderately robust. Outer branch of the first pair of feet (fig. 9) half as long as the first joint of the inner branch; in the *male* the inner branch of the second pair (fig. 10) is 3-jointed, the second joint having an apical spine, the last joint four, long, plumose setæ. The fifth pair in the *female* (fig. 11) has a large basal joint, the inner portion of which is much elongated, and bears internally four strong setæ; the second joint is oblong, subovate, with five long setæ on the outer margin, two of

which are very slender; the margins of both joints are densely ciliated; in the *male* the fifth foot is very small (fig. 12), the basal joint almost obsolete, and bearing only two setæ, one external and one internal; second joint small and ovate, 4-setose. The first abdominal segment has a pair of bi-setose appendages resembling a rudimentary foot (fig. 14). Length $\frac{1}{30}$ th of an inch (.85 mm.).

The anterior antennæ of this species vary a good deal in the comparative lengths of the different joints, and sometimes one of the joints is altogether deficient (fig. 3). The outer branch of the first foot is often, if not always, 2-jointed owing to the coalescence of the second and third joints—a condition which is met with frequently in other members of the genus. Though not agreeing quite accurately with the figures given in Claus's memoir, this must, I think, be taken as a northern variety of *L. similis*, Claus. It is, perhaps, the commonest British species of the genus, occurring from above high-water mark to a depth of several fathoms. Occasionally also it is found in brackish pools, as for instance at Isle Oronsa, Skye (*Rev. A. M. Norman*), and at Clifden, Co. Galway. The following are the stations from which I have specimens:—Amongst weeds in rock-pools, between tide-marks at Sunderland and several places on the Northumberland coast; Isle of Aran, Clifden, Westport, Roundstone, and Ventry Bay (Ireland); Scilly Islands, dredged in fourteen fathoms, and plentiful on weeds between tide-marks.

5. LAOPHONTE CURTICAUDA, *Boeck*, Pl. LXXIII, figs. 15—18, and Pl. LXXVI, figs. 1—9.

Laophonte curticauda, *Boeck*. Oversigt Norges Copepoder, p. 55 (1864).

Body rather robust (fig. 1), dorsal angles not much produced, rostrum very short; caudal segments not much longer than broad, and about as long as the last abdominal ring. Anterior antennæ (fig. 2) in the *female* 7-jointed; first three joints much longer than the rest, the following three short and nearly equal, the last somewhat longer; in the *male* the fourth and fifth joints are swollen, the third very narrow, and the last two form a prehensile claw. The posterior foot-jaw (Pl. LXXIII, fig. 16) has an elongated hand, the inner margin of which is convex, terminal claw long and curved. The first foot has a long 2-jointed peduncle (fig. 3) which is ciliated on the outer margin; the inner branch is stout, the outer slender, 3-jointed and more than half the length of the first joint of the inner branch. The outer branches of the second, third, and fourth pairs are stout and fringed with spine-like cilia, the marginal spines long and rather slender; inner branches stout and 2-jointed (Pl. LXXIII, fig. 17, and Pl. LXXVI, figs. 4 and 6). In the *male* the inner branch of the second pair (fig. 18) has three long terminal setæ, and one much shorter seta, which ends in a strong hook; the third pair (Pl. LXXVI, fig. 5) has both branches very thick, the second joint of the

inner branch having four long apical setæ, and a very stout beak-like spine at the outer angle; the last joint of the outer branch has four very large terminal spines, the longest of which is nearly as long as the limb itself; and besides these, there are five or six small subsidiary spines attached between the bases of the larger ones; the outer margins of both branches are densely clothed with spine-like cilia. Fifth pair (figs. 7 and 8) short and broad, basal joint broadly triangular, its inner portion large, bearing four or five short setæ on the outer, and three large and one short on the inner margin, the rest of the margin being shortly ciliated; second joint very broadly ovate, angulated internally, and bearing several slender setæ of various lengths; in the male (fig. 9) the fifth pair has both branches narrower, more angular, and somewhat less profusely setose. Length $\frac{1}{3}$ rd of an inch (.79 mm.).

This species is not unfrequently taken in the surface-net not far from the shore, in tidal pools amongst *Algæ*, and by the dredge in small depths of water. I have found it on mud-covered rocks at Whitburn (Durham), amongst weeds at Sunderland, Little Cumbrae, Clifden, Roundstone and Westport, and in tow-net gatherings from Westport Bay. It occurs also amongst Copepoda dredged by the Rev. A. M. Norman at Oban, in a depth of five fathoms, and is common in washings of *Laminariæ* from Hillswick, Shetland.

The short and broad fifth foot, with the remarkable angulation of the inner margin of its second joint, in the female, together with the strongly marked cha-

racters of the second and third pairs of feet in the male, amply suffice to distinguish this from all other species; it is also much shorter and stouter than any other known to me, having indeed, at first sight, more the appearance of *Dactylopus* than of *Laophonte*. The second and third feet of the male show an approach to the structure of those limbs in *Harpacticus*; and it would seem almost desirable, on this ground, to establish a new genus for the reception of this species.

6. *LAOPHONTE LONGICAUDATA*, Boeck. Pl. LXXIV, figs. 12—15; and Pl. LXXVI, figs. 10—15.

Laophonte longicaudata, Boeck. Oversigt Norges Copepoder, p. 55 (1864).

— *Hodgii*, Brady. Nat. Hist. Trans. Northumberland and Durham, vol. iv, p. 437, pl. xxi, figs. 1—9 (1872).

— — Brady & Robertson. Brit. Assoc. Report, p. 196 (1875).

Body more slender than in the preceding species; margins of the segments smooth; caudal segments long and slender, about twice as long as the last abdominal joint (Plate LXXIV, fig. 15). Anterior antennæ (Plate LXXVI, fig. 10) rather short, 7- or 8-jointed, first three joints much longer than the following four or five, the relative lengths being as follows:*

1,	2,	3,	4,	5,	6,	7,	8.
5	9	6	2	2	3	2	2

* These measurements apply only to the most common forms. When

In the male, the antenna is clawed, as in *L. curticauda*. The outer branch of the first foot (fig. 12) is very short, the inner long and slender; the second foot-jaw is smaller, but otherwise does not differ much from that of the preceding species; the inner branches of the second, third, and fourth pairs (figs. 13, 14) have the first joints longer than in *curticauda*. The third foot in the male (Plate LXXIV, fig. 13) is only moderately spinous, but the inner branch is 3-jointed, and has a slender spine attached to the apex of the second joint. Fifth foot (fig. 14) small, having both inner and outer segments well developed, the inner having four marginal setæ, the outer one large apical, and several minute marginal setæ; second joint elongate, ovate, 5-setose. Length $\frac{1}{3}$ rd of an inch (.77 mm.).

This species was met with in dredged material from several places off the Durham coast:—Hartlepool; Seaham, twenty to thirty fathoms; Hawthorn, twenty-seven fathoms. I have found a few examples among Copepoda washed from weeds in Ventry Bay, Ireland, and sent to me by Mr. E. C. Davison.

7. LAOPHONTE LAMELLIFERA, *Claus.* Pl. LXXV, figs. 15—23.

Cleta lamellifera, Claus. Die frei-lebenden Copepoden, p. 123, t. xv, figs. 21—25 (1863).

Body robust (fig. 15), arcuate; rostrum short, the antennæ are only 7-jointed the variation takes place in the flagellum or slender terminal portion, which then has three instead of four articulations.

hinder margins of the segments, except the last, distantly denticulated; the dorsal border of each thoracic segment is produced below the middle, so as to form a broadly rounded lip; the abdominal segments are only slightly convex dorsally. Caudal segments (fig. 22) subconical, appressed, longer than the last abdominal segment, with two small lateral setæ and two at the apex, the longest of which is scarcely as long as the last segment of the abdomen. Anterior antennæ short and stout (figs. 16, 17), 5-jointed, the ensiform appendage in the male very broad. Outer branch of the first pair of feet (fig. 20) about one third as long as the inner. Lower foot-jaw (fig. 19) short. Fifth foot (fig. 21) elongated; basal joint long and broad, its inner segment oblong, subquadrate, and produced nearly as far as the apex of the second joint which is subtruncate, and bears four long setæ, one at the apex, and one at the middle of the inner margin; second joint long and narrow, 6-setose. The integument of the animal is thick and porous, the pores being arranged in widely-separated irregular patches (fig. 23). Length $\frac{1}{8}$ th of an inch ($\cdot 9$ mm.).

L. lamellifera is not a very abundant species; though I have notes of its occurrence in many different localities, the number of examples obtained from each place is usually small. I have found a very few specimens on *Laminariæ* and on muddy rocks near Sunderland, several in dredgings from a depth of twenty fathoms among the Scilly Islands, off Port Dinlleyn, North Wales, Portincross (Ayrshire), and the Islands of Cumbræ and Bute; from two fathoms in Lough

Swilly (Donegal), and from dredgings made in Ventry Bay by Mr. E. C. Davison; also from weed-washings at Tobermory (*Rev. A. M. Norman*).

8. LAOPHONTE HISPIDA, *Brady and Robertson*. Pl. LXXXI, figs. 1—11.

Asellopsis hispida, B. & R. *Ann. and Mag. Nat. Hist.*, vol. xii, p. 137, pl. ix, figs. 6—10 (1873).

Body elongated, much depressed (fig. 1), lower thoracic segments distinctly narrowed, the margins of the first three abdominal segments produced downwards at the sides in an imbricated manner. Anterior antennæ (fig. 2) short, densely setose, 7-jointed, first two joints not much longer than broad, third about the same length but much narrower, fourth very short and broad, fifth about twice as long as the fourth, sixth and seventh equal and very small, the proportionate lengths of the joints, beginning at the base, being as follows—9, 9, 9, 3, 5, 2, 2; posterior antennæ nearly as large as the anterior, biarticulate, bearing a very small 1-jointed secondary branch. Mouth-apparatus as in the typical *Laophonte*; second pair of maxillipeds (fig. 6) 3-jointed, with an oval hand and long slender claw. First pair of feet (fig. 7) having the inner branch very long and biarticulate, the first joint much elongated, terminal claw thick and strong; outer branch also biarticulate, the entire length being less than half that of the first joint of the inner branch;

second, third and fourth pairs of feet (figs. 8, 9), with the outer branch long and 3-jointed, the inner very short and 2-jointed; fifth pair (fig. 10) rather narrow and elongated, the two laminae being of nearly equal length, with finely ciliated margins, and a few short setae. Caudal segments (fig. 11) very broad, rounded; surface hispid towards the margins; terminal setae very short, the longest not much exceeding the length of the segment itself. Length $\frac{1}{35}$ th of an inch (.73 mm.).

Several specimens of *L. hispida* were taken in the surface-net in Westport Bay by Mr. Robertson and myself. We have also dredged it sparingly in a depth of from four to ten fathoms off the Durham coast, and more abundantly on a bed of fine clean gravel off Glen Sannox, Arran (N.B.), off the islands of Bute Cumbrae, in depths of ten to twenty fathoms amongst the Scilly Islands, and off Port Dinlleyn, Caernarvonshire.

The general habit of this species is very distinct from all others of the genus, and I was at first induced, more on this account than from any very marked peculiarities of structure, to consider it as a distinct generic type; but further investigation revealing no points of structure materially different from those belonging to the various species of *Laophonte*, I have here assigned it to that genus.

Genus 19. NORMANELLA, nov. gen.

Animal rigid, subcylindrical; abdomen as wide as the thorax and not distinctly separated from it; caudal segments and setæ small. Anterior antennæ short, 7-jointed; secondary branch of posterior antennæ small, 1-jointed; mandible palp small, with two minute 1-jointed branches; maxillar palp well developed, with several setose digits; second foot-jaw forming a small clawed hand. Inner branch of first pair of feet elongated, 2-jointed, the second joint short, and bearing two long apical setæ; outer branch short, 3-jointed; inner branches of the second, third, and fourth pairs 2-jointed; fifth pair foliaceous, 2-jointed.

In general appearance this genus resembles *Laophonte* and *Cletodes*. From the former, however, it is separated by its branched mandible-palp and the want of a prehensile claw on the first foot; from *Cletodes* by the presence of a branch on the posterior antenna, by the branched mandible-palp, and the elongated inner branch of the first pair of feet.

1. *NORMANELLA DUBIA*, *Brady and Robertson*. Pl.
LXXVIII, figs. 12—22.

Laophonte dubia, Brady & Robertson, Brit. Assoc. Report, p. 196
(1875).

Female as seen laterally (fig. 12) somewhat con-

stricted in the middle, which is the narrowest part of the animal, posterior margins of the segments finely denticulated, but not produced on the dorsum, except the last abdominal segment, which has a posterior spine ; rostrum short; caudal segments (fig. 22) shorter than the last abdominal joint, and bearing three apical setæ, the largest of which is not much longer than the last segment. Anterior antennæ (fig. 13) 7-jointed, densely setiferous on the outer margin, first three joints larger than the rest, which are short and subequal. Secondary branch of the posterior antenna small (fig. 14), 1-jointed, and bearing four setæ. Mandible slender (fig. 15), palp slender, with two small 1-jointed branches. Second foot-jaw (fig. 18) small and slender. Inner branch of first pair of feet (fig. 19) long and slender, the second joint bearing two curved apical setæ, only one fourth as long as the first joint, which has ciliated margins and a long marginal seta near the apex. Fifth pair of feet (fig. 21) composed of a large, subtriangular basal joint, and a smaller external joint, both of which bear several long marginal setæ ; the internal portion of the first joint is largely developed, and reaches as far as the apex of the second. Length $\frac{1}{37}$ th of an inch (.68 mm).

This species may perhaps have been often overlooked, owing to its small size and its general resemblance to *Cletodes* and *Laophonte*. I have notes of its occurrence as follows:—At New Grimsby and Porcressa Bay, Scilly, fourteen to twenty fathoms ; Clew Bay ; off Marsden and Hartlepool (Durham coast), ten to thirty fathoms.

Genus 20. CLETODES, Brady (1872).

(*Cletodes*, Brady, Nat. Hist. Trans. Northumberland and Durham, 1872; Boeck, Nye Slægter og Arter af Saltvands-Copepoder, 1872. *Lilljeborgia*, Claus, Die Copepoden-Fauna von Nizza, 1866. *Orthopsyllus*, Brady & Robertson, Ann. and Mag. Nat. Hist., 1873.)

Animal resembling *Laophonte* in general appearance; abdomen as broad as the cephalothorax, and not distinctly separated from it. Anterior antennæ short, 4- to 6-jointed; secondary branch of posterior antennæ 1-jointed, very small, or reduced to a few setæ; mouth-organs like those of *Laophonte*. First pair of feet small, non-prehensile; inner branches of all the four pairs of swimming feet composed of two joints, the first of which is very short. Fifth pair narrow, foliaceous.

The characters which I formerly supposed to separate this genus from *Lilljeborgia* (Claus), do not, on further examination, hold good. There is mostly, if not always, a small branch attached to the lower antenna; and the inner branches of the swimming feet, though stated by Claus, in the generic definition of *Lilljeborgia*, to be "rudimentary," are yet described in the text as 2-jointed; there is, therefore, scarcely any difference between it and *Cletodes*. The name *Lilljeborgia*, however, having been previously used for a genus of Amphipoda, must be discarded, as has already been done by M. Boeck, in favour of *Cletodes*, the term *Orthopsyllus*, which, in a previous memoir, was pro-

posed as a substitute for *Lilljeborgia*, being also allowed to lapse.

1. CLETODES LIMICOLA, *Brady*. Pl. LXXIX, figs. 1—12.

Cletodes limicola, *Brady*. Nat. Hist. Trans. Northumberland and Durham, vol. iv, p. 438, pl. xxi, figs. 10—17 (1872).

— *pectinata*, *Brady & Robertson*. Brit. Assoc. Report p. 196 (1875).

Animal, as seen from behind, elongated, distinctly indented at each ring of the body. First segment of cephalothorax short, about equal in length to the two following; second and third abdominal segments produced into spinous processes at the lower lateral angles. Anterior antennæ in the *female* (fig. 2) much shorter than the first cephalothoracic segment; first three joints nearly equal, fourth about half as long as the third, fifth as long as the third, but much more slender, sixth very short; in the *male* (fig. 3) forming at the fourth joint a large vesiculiform swelling, last two joints elongated and uncinatè. Hand of the posterior foot-jaw short, ovate, often finely ciliated on the inner margin; terminal claw long and slender. Swimming-feet slender; the outer branches ciliated on the margins, and bearing at the apex of each joint, on the external margin, a long slender spine; terminal setæ long and slender; the middle joint has a long apical seta at the inner margin; inner branches 2-jointed, the first joint very small, the second long, almost fili-

form, and dividing at the extremity into one short and one or two very long, lash-like branches; first foot much shorter than the rest. Basal joint of the fifth pair (fig. 11) small, but produced into a long inner segment, which has a ciliated inner margin and three stout apical setæ, and reaches nearly as far as the end of the second joint; second joint elongated, narrow, bearing three stout, curved, marginal setæ, and two at the apex. In the *male* (fig. 12) the two branches are of nearly equal length, very narrow, simple, the external branch bearing one, the internal two, long apical setæ. Caudal segments short, but longer in the male than in the female (?); setæ, one on each segment, scarcely longer than the segment itself. Length, $\frac{1}{3}$ rd of an inch (.77 mm.).

I have included in this description the form which, by Mr. Robertson and myself, was noted (in our 'Report of Dredging on the Coasts of Durham and Yorkshire') as a new species under the name *Cletodes pectinata*. A re-examination of these specimens leads me to think that there is no sufficient reason to separate them from the previously described species, though it is certainly very difficult to decide in these minute and nearly allied forms as to how much latitude must be allowed for variation. There occurs not unfrequently a form with very long and slender caudal rami—almost as long as those of *C. longicaudata*—which, except for this peculiarity, I am unable to distinguish from *C. limicola*. The difference is certainly not a sexual one, as both forms are to be seen in the adult oviparous females. For the present I am content to note the

long-tailed form as a variety:—var. *gracilis*. This species has in all cases occurred in dredgings from depths of 20—45 fathoms, and usually amongst muddy sand. It has been observed in the following localities:—Off the coasts of Durham and Yorkshire, amongst the Scilly Islands, and in Westport Bay, Ireland.

2. *CLETODES LONGICAUDATA*, *Brady and Robertson*. Pl.
LXXIX, figs, 13—19.

? *Cletodes laticauda*, Boeck. Nye Slægter og Arter af Saltvands-
Copepoder, p. 20 (1872).

— *longicaudatus*, B. & R. Brit. Assoc. Report, p. 196
(1875).

Female. — Animal slender, elongated; rostrum moderately long; caudal segments very long and slender, about as long as the last three abdominal segments; at the upper fifth of the outer margin is affixed a long slender spine (fig. 19), and at the apex three setæ, two of which are very small, but the median one longer than the tail itself. The anterior antennæ (fig. 14) are 6-jointed, third joint the longest, last three short and subequal; ensiform filament very stout. Second pair of foot-jaws of moderate size, with an ovate hand. Inner branch of the first pair of feet (fig. 15) larger than the outer, its last joint as long as the entire outer branch, cylindrical, and bearing two long terminal setæ; inner branches of second, third, and fourth pairs shorter than the outer, the fourth having three, the second and third

two, terminal setæ (figs. 16 and 17), the first joint minute; marginal spines of the outer branches slender and plumose. Fifth foot in the female (fig. 18) foliaceous, the distal joint long, bearing two long setæ at the apex, two on the outer, and one on the inner margin, basal joint small, with three internal and one external setæ (fig. 12). Length $\frac{1}{3}$ rd of an inch (.79 mm.)

Several specimens were found amongst dredged material, from a depth of five fathoms off Hartlepool, and one or two from 7—29 fathoms off Portincross, Ayrshire.

M. Boeck's description of *Cletodes laticauda* may very possibly be meant to apply to this species, but his account of the first pair of feet and of the caudal segments does not agree accurately with my own observations of those organs in *C. longicaudata*, and it seems, therefore, best to adhere to the name already proposed by Mr. Robertson and myself.*

* I leave the descriptions of the two species *C. longicaudata* and *C. limicola* as originally written, but must express some doubt as to their entire accuracy. That two distinct species are referred to I have no doubt, but as they occur mixed up together in the same gatherings, and are not readily distinguishable except when quite perfect, it is quite likely that there may be some confusion between the two. The distinctions of sex especially, and of the fifth pair of feet, I have not been able quite clearly to make out.

3. CLETODES PROPINQUA, *Brady and Robertson*. Pl.
LXXVII, figs. 9—17.

Cletodes propinqua, B. & R. Brit. Assoc. Report, p. 196 (1875).

Animal, as seen laterally (fig. 10), arcuate, of nearly equal thickness throughout; seen from above (fig. 9) oblong, subtruncate behind; abdomen nearly as stout as cephalothorax; rostrum minute; caudal segments (figs. 16 and 17) short, subovate, distant, pointed at the apex, not as long as the last abdominal segment. Anterior antenna short (fig. 11), not half the length of the first body-segment; last four joints much shorter than the rest. Mouth-organs as in the preceding species. Inner branch of first pair of feet (fig. 14) shorter than the outer, marginal spines of the outer branch very long and slender. Basal joint of the fifth pair (fig. 15) in the *female* produced at the inner side, bearing at the apex a lancet-shaped spine, and on the margin two long setæ; terminal joint elongated, subovate, with one long apical and three short marginal setæ. The fifth pair in the *male* are very similar to those of the female. Caudal segments (fig. 16) provided with two or three small marginal hairs and one apical seta, which is about as long as the last abdominal ring. Length $\frac{1}{40}$ th of an inch (.63 mm.).

I have notes of the occurrence of *C. propinqua* in the following localities:—In twenty fathoms off St. Mary's, and in fourteen fathoms, New Grimsby Harbour, Scilly; Clew Bay, Ireland; Tobermory (*Rev.*

A. M. Norman); and in thirty-five fathoms off Marsden, Durham coast. The number of specimens found in each case was very small. The two figures (16 and 17, in Pl. LXXVII) show tail-segments of different shapes, but whether they belong to male and female of the same species, or to entirely distinct species, I have not been able to satisfy myself.

4. CLETODES LINEARIS, *Claus.* Pl. LXXX, figs. 1—14.

Lilljeborgia linearis, Claus. Die Copepoden-Fauna von Nizza, p. 22, t. ii, figs. 1—8 (1866).

Orthoptyllus — B. & R. Ann. and Mag. Nat. Hist., vol. xii, p. 138 (1873).

Body elongated, nearly straight, cylindrical; first segment about as long as the three following. Rostrum moderately long. Abdomen as thick as the thorax, and constituting half the length of the body. Caudal segments very broad, scarcely equalling in length the last abdominal segment; the posterior borders of all the body-segments, except the last, are fringed with rows of short rectangular teeth. Anterior antennæ short and stout, 4-jointed; in the female (fig. 3) the inner margin of the second joint forms a very large and stout spine; the third joint is as long as the second, but only about half as broad, the fourth is short and nearly square, truncate, bearing several stout, short setæ, and a curved spine at the upper apical angle; the second and third joints also have several strong setæ, and the ensiform appen-

dage which springs from the apex of the third, is short, broad, and curved ; the anterior antenna of the female (fig. 2) has the second joint developed into a very large, subquadrate swelling, while the last two joints are much more slender and form a strong claw-like appendage, the last joint having also a subsidiary spine at the base. Setæ of the posterior antennæ (fig. 4) very strong and spine-like ; secondary branch 1-jointed, of moderate size, and having four setæ. Hand of the lower foot-jaw ovate, with a slender terminal claw. Inner branch of the first foot (fig. 7) rather longer than the outer, 2-jointed, terminating in two long setæ, the longest of which has an apical tuft of spreading, root-like hairs ; the outer branch has three setæ, one of which also is tufted at the apex. The second foot is shorter than the three following pairs, and is much more slenderly spined ; inner branch of the second pair (fig. 8) slender, not much longer than the first joint of the outer branch, 2-jointed, the first joint extremely short, the second having one marginal and two apical setæ, all of about equal length, and finely plumose beyond the middle. Inner branch of the third foot robust (fig. 9), the two joints subequal, bearing at the apex one long terminal spine and two setæ, the shorter of which is plumose (these appendages are stouter in the male than in the female) ; the terminal spines of the outer branch are very short and thick. The fourth pair (fig. 10) has the inner branch rudimentary, 2-jointed, and provided with one stout apical seta and two shorter and more slender ; the second, third, and fourth pairs are of

nearly equal size, but short, being scarcely longer than the width of the thorax; the margins of all the joints of the outer branches are fringed with spine-like setæ, and the apical spines are large and strong. The fifth pair, in the female (fig. 11), has the basal joint well developed and forming a large internal segment, which bears five marginal setæ; outer branch subovate, having four large and two small setæ; the margins of both joints finely ciliated; the tail-segments have at the apex one stout seta about equal in length to four of the abdominal joints, and on the lateral margins are also three or four minute setæ. Length, $\frac{1}{2}$ inch (1.1 mm.).

This is a very distinct and at the same time one of the least common of British species. I for a long time knew it only from two specimens, one found on a Sponge in Westport Bay, and one taken amongst *Algæ* at St. Mary's, Scilly; but more recently I have found several specimens in a collection of Copepoda washed from the roots of *Algæ* gathered in Roundstone Bay.

Genus 21. ENHYDROSOMA, Boeck.

(Boeck, Nye Slægter og Arter af Saltvands-Copepoder, 1872.)

Body subcylindrical; first pair of antennæ short and stout, 5-jointed; second pair nearly as large as the first, 2-jointed, secondary branch small, 1-jointed;

mandible-palp simple, 3-jointed. Maxilla-palp small, 2-jointed. First pair of foot-jaws small, with a terminal claw and two or three marginal claw-like setæ; second pair forming a prehensile hand. Inner branch of the first pair of feet 2-jointed, non-prehensile, shorter than the outer branch; inner branches of the second, third, and fourth pairs also short and 2-jointed; outer branches 3-jointed; fifth pair short and broad, 2-jointed.

This genus differs from *Cletodes* in having a 1-jointed secondary branch springing from the posterior antennæ, and in the elongated 3-jointed mandible-palp.

1. ENHYDROSOMA CURVATUM, *Brady and Robertson*,
Pl. LXXXI, figs. 12—15;
and Pl. LXXXII, figs.
11—19.

Rhizothrix curvata, B. & R. Brit. Assoc. Report, p. 197 (1875).

The anterior antennæ (figs. 13 and 14, Pl. LXXXII) are short and stout, and beset with numerous setæ, many of which are strongly plumose; the penultimate joint in the male forms a large vesiculiform swelling and the last joint is claw-like. The posterior antenna (fig. 14) has attached to its apex three stout, lancet-shaped setæ,—one of which is strongly pectinate,—and four or five smaller lateral setæ; the secondary branch bears two setæ. The mandible (fig. 15) is bluntly

toothed, the palp elongated, its first and second joints each bearing one strong plumose seta, the last joint four apical setæ. The second foot-jaw (fig. 18) is well developed, its terminal claw long and slender. Both branches of the first pair of feet (Pl. LXXXI, fig. 12) have two very long terminal setæ, which bear near their apices three or four lash-like cilia. In the three following pairs the inner branch is very small and has three plumose terminal setæ; the outer branch is of moderate size, and has three plumose setæ at the apex, while the marginal spines are elongated, slender, and strongly pectinate. The fifth pair in the *female* (Pl. LXXXII, fig. 19) has the first joint very broad and short, the internal segment fringed with five stout plumose setæ; the second or outer joint is ovate, crenulated on the external margin, bearing on the inner margin two stout setæ, and at the apex a short, broad spine. In the *male* (Pl. LXXXI, fig. 14) the fifth foot is smaller and is incompletely divided into two laminæ, each of which bears four or five plumose setæ. The caudal laminæ are broadly ovate (fig. 15) and are provided with five minute marginal setæ. The animal when seen from the side (Pl. LXXXII, fig. 11) is arcuate, the head and tail being sharply bent upon the body; the integument glabrous. Length $\frac{1}{37}$ th of an inch (.67 mm.).

I have not been able to identify this with either of the two species (*E. curticauda* and *E. longicaudata*) described by M. Boeck, the fifth pair of feet being apparently quite different. *E. curvata*, though occurring pretty plentifully in several widely separated

localities, appears to be somewhat local in its distribution. I have notes of its capture as follows:—Off Porcrossa Bay and in New Grimsby Harbour (Scilly Islands), dredged in 10—20 fathoms; abundant in a depth of three fathoms on a sandy bottom, Lough Swilly; off the islands of Bute and Cumbræ, sixteen fathoms; off Portincross, Ayrshire, fifteen fathoms; off Port Dinleyn, Carnarvonshire, ten fathoms; off Robin Hood's Bay, Yorkshire (one specimen only seen), thirty-five fathoms.

Sub-family 6. NANNOPINÆ, nov. sub-fam.

Anterior antennæ short, 6-jointed; secondary branch of posterior antennæ 1-jointed; mandible-palp 1-branched, second foot-jaw forming a prehensile claw. Inner branches of the first and second pairs of feet 2-jointed, non-prehensile, of the third and fourth pairs rudimentary, and consisting only of a few setæ, fifth pair foliaceous, 2-branched.

This sub-family contains only two genera, *Nannopus* and *Platychelipus*, both of which are new.

Genus 22. NANNOPUS, nov. gen.*

Like *Tachidius* in general appearance. Head consolidated with thorax; body-segments denticulated on

* νάννος, dwarf; ποῦς, foot.

the posterior margins. Anterior antennæ short, 6-jointed (?); outer branches of all the swimming-feet 3-jointed; inner branches of the first and second pairs 2-jointed, short, non-prehensile, of the third and fourth pairs obsolete and reduced to a single seta.

1. NANNOPUS PALUSTRIS, *nov. sp.* Pl. LXXVII, figs.
18—20.

Anterior antennæ very short and stout, scarcely half as long as the cephalic segment. Terminal setæ of the outer branch of the first and second feet strongly and distantly plumose; inner branch not half as long as the outer, first joint fringed with setæ at the apex, second having three terminal setæ. In place of the inner branch of the third and fourth pairs is a small tubercle, which gives attachment to a long plumose seta and two or three very small cilia.

I have seen only one or two specimens of this species, which were so coated with mud that it was difficult to get a distinct view of the limbs, nor did I at first recognise anything very noteworthy about them, else possibly a little extra care might have enabled me more fully to elucidate their structure. There seems, however, to be no reason to doubt the complete distinctness of the genus, and I therefore think it best to describe it, even though imperfectly. Its nearest ally is probably *Jurinia*, Claus, but in that genus the third and fourth pairs of feet have the inner branches well

developed, while in *Nannopus* they are obsolete. The second foot-jaw, which in *Jurinia* is said to be reduced to a few setæ only, has not been observed in *Nannopus*. The specimens were taken in pools of brackish water in a salt marsh at Seaton Sluice, Northumberland, a locality which has yielded many interesting species and which would doubtless well repay an attentive investigation by some naturalist living within easy reach of it.

Genus 23. PLATYCHELIPUS, nov. gen.*

Anterior antennæ 6-jointed; secondary branch of the posterior antenna small, 1-jointed; mandible-palp composed of a single 2-jointed branch (Pl. LXXIX, fig. 20) bearing four apical setæ; maxilla (fig. 21) well developed, palp composed of three large setiferous digits; first foot-jaw (fig. 22) stout, having three large marginal segments, all of which bear short, strong setæ; second pair of foot-jaws (Pl. LXXX, fig. 19), forming a clawed prehensile hand. First pair of feet having both branches 2-jointed, the inner elongated and slender, but not forming a clawed hand. Inner branch of the second pair small, 2-jointed, outer branch 3-jointed; the third and fourth pairs have the inner branch reduced to a setiferous tubercle, the outer strong and 3-jointed; fifth pair, 2-branched, foliaceous.

This genus agrees very much with *Nannopus*, but it

* πλατύς, broad; χηλή, claw; πούς, foot.

is clearly separated from it by the 2-jointed branches of the first foot. Only one species has yet been observed.

1. PLATYCHELIPUS LITTORALIS, *nov. sp.* Pl. LXXIX, figs. 20—23; and Pl. LXXX, figs. 15—19.

Animal somewhat like *Laophonte*. Anterior antennæ 6-jointed (Pl. LXXX, fig. 15); first two joints large and thick, third equally long but only about half as broad, fourth and fifth about one third as long as the third, sixth equal to the third but more slender. The last four joints bear numerous short spine-like setæ on the outer margin, besides several which are longer and more hair-like. The peduncle of the first pair of feet is stout and 2-jointed, the basal joint being beset with numerous setæ on its outer surface (fig. 16); the second joint has two long spines on the inner and one on the outer margin; the outer branch is short and 2-jointed, the marginal spines slender; inner branch elongated, first joint longer than the entire outer branch, second about half the length of the first and terminating in a single, slightly curved, claw-like, but slender seta, which is as long as the limb itself; the inner branch of the second pair (fig. 17) is only half as long as the outer, its two joints equal in length but the second very narrow and bearing a long, slender, terminal seta. The outer branches of the second,

third, and fourth pairs are 3-jointed and bordered with chitinous plates, their marginal spines extremely stout, and in length much exceeding the width of the limb; the last joint has at the apex two long and much more slender spines. Basal joint of the fifth pair produced into a large quadrangular internal segment, which has four apical spines and a few small cilia (fig. 18); second joint smaller, subovate, its external margin divided into five setæ.

Several examples of this very distinct species were noticed in a gathering from between tide-marks at Lake Lothing, Suffolk, where the water of Oulton Broad finds its way to the sea. Though the gathering was made amongst the fronds of *Fuci* the water would no doubt be brackish. I have more recently found a few examples at Seaton Sluice, in the brackish pools which have been spoken of in connection with *Nannopus palustris* and other species.

Sub-family 7. HARPACTICINÆ, Boeck (in part).

Body cylindrical, or, less commonly, broad and depressed. First pair of antennæ 5—9-jointed; secondary branch of second pair 2- or 3-jointed. Mandible-palp 2-branched, usually largely developed. First foot-jaw triangular, not chelate; with several digitate marginal processes, second foot-jaw forming a strong clawed hand; outer branch of the first pair of feet always, inner branch usually, clawed and

prehensile, first or second joint of the outer branch elongated; second, third, and fourth pairs with both branches 3-jointed; fifth pair 2-jointed and usually foliaceous. One ovisac.

The genera belonging to this sub-family are *Dactylopus*, *Thalestris*, *Westwoodia*, *Ilyopsyllus* (?), *Harpacticus*, *Zaus*, and *Peltidium*. The genus *Ilyopsyllus* is included provisionally only in this group; its structure has not been fully made out, but the abnormal form of the mandibles and antennæ will probably necessitate its removal to some other position.

Diagnosis of Genera of Harpacticinæ.

First pair of swimming-feet, having	{	both branches composed of	{ two joints <i>Harpacticus</i> .		
			{ three joints; middle joint of the outer branch	{ greatly elongated <i>Thalestris</i> .	
				{ not much longer than the first joint; fifth pair of feet	
				{ foliaceous <i>Dactylopus</i> . elongated, sub-falciform, and strongly spined <i>Peltidium</i> .	
{	{	the outer branch composed of three, the inner of	{ one joint; mandible-palp	{ two-branched <i>Westwoodia</i> .	
				{ simple, bisetose <i>Ilyopsyllus</i> .	
				{ two-joints <i>Zaus</i> .	

Genus 24. DACTYLOPUS, Claus (1863).

Body elongated, more or less cylindrical; first pair of antennæ usually 5—9-jointed; in the male geniculated; inner branch of the second pair of moderate size, 2- or 3-jointed. Maxilla-palp well developed, the basal portion numerously clawed and having one or two lateral processes; mandibles well developed, the

palp composed of a wide basal joint and two uniarticulate branches; anterior foot-jaws of moderate size, posterior slender and forming a clawed hand. First four pairs of feet having both branches 3-jointed; inner branch of the first pair elongated, first joint very long, second and third extremely short and ending in two slender claws, outer branch shorter, the middle joint long, first and third short, ending in four claws; fifth pair 2-jointed, foliaceous. Ovisac single or double.

1. *DACTYLOPUS TISBOIDES*, *Claus*. Pl. LIV, figs. 1—16.

Dactylopus tisboides, *Claus*. Die frei lebenden Copepoden, p. 127, taf. xvi, figs. 24—28 (1863); Die Copepoden-Fauna von Nizza, p. 27, taf. iii, figs. 1—7 (1866).

— — *Brady*. Nat. Hist. Trans. Northumberland and Durham, vol. iii, p. 131 (1868).

? — *Normani*, *idem*. Ibid., vol. iv, p. 441, pl. xx, figs. 13—17 (1872).

Body robust; head produced into a short, conical beak; anterior antennæ in the female 9-jointed (8-jointed, *Claus*), tapering gradually from the base, the seventh and eighth joints being much the shortest (figs. 2 and 14); hinge-joint in the male (fig. 3) between the sixth and seventh joints. Inner branch of the posterior antenna (fig. 4) 3-jointed. Second foot-jaw slender, the hand elongate-oval and ciliated on the inner margin, near the middle of which is a single long seta. Outer margins of both branches of the first pair of feet densely setose and spinous; first joint of the inner branch longer than the entire outer limb, and

armed above the middle of the inner margin with a single, long, plumose seta (fig. 9); middle joint of the outer branch thrice as long as the first or third, ciliated on both margins, the cilia of the outer margin being often strong and almost spinous; the second, third, and fourth pairs (fig. 11) have the branches nearly equal, bearing long plumose setæ, and ciliated on the external borders; the inner branch of the second pair in the *male* (fig. 10) has the second and third joints coalescent, the outer margin deeply excavated above and below the middle, and bearing one rather large crooked spine, several strong short setæ, and at the apex two stunted spines; setæ of the inner margin three; fifth pair (figs. 12 and 15) in the *female* composed of two subequal, broadly ovate joints, each of which bears several rather long apical setæ; the outer joint has also along its free margin a series of oblong, curved, pellucid patches (fig. 12 *a*); in the *male* the joints of the fifth pair are, as is usual in the Harpacticinæ, more angular, smaller, and less profusely setose (figs. 13 and 16). Caudal segments short; larger tail setæ two thirds the length of the body, outer setæ about half as long. Length $\frac{1}{4}$ th of an inch (·56 mm.).

This is probably the commonest British species of the genus *Dactylopus*, occurring not unfrequently in all kinds of localities, from the brackish water of estuarine pools to depths of at least forty fathoms. I have notes of its capture in the following localities:—Durham coast, amongst *Laminariæ*; in brackish pools, at the mouth of the Seaton Burn, Northumberland; dredged off Red Cliff and Robin Hood's Bay, Yorkshire, in thirty-five

fathoms; brackish pools near the River Stour, at Manningtree, Suffolk; abundant on weeds at low water mark, Little Cumbrae; off Portincross, Ayrshire, fifteen fathoms; Scilly Islands, ten to forty fathoms; brackish pools at Clifden, Connemara; and in surface-net gatherings from Westport Bay, Mayo. It has also been found by the Rev. A. M. Norman between tide-marks at Oban; on weeds at Tobermory, Mull; Bressay Sound, Shetland; and in brackish water at Isle Oransa, Skye.

The range of variation of *Dactylopus tisboides*, especially as to strength and quantity of setose armature, is very considerable. Two extreme forms, one from brackish water, the other from a purely marine habitat, are figured in the plate, but even in brackish water one may sometimes meet with specimens nearly as strongly spinous and setose as any of those from the open sea. Speaking broadly, however, we may say that there are two races or varieties of the species, characterised in one case by a robust body and strong setæ, in the other by a slender body and delicate setæ. It is interesting to note that, in other species, especially in those whose habitats—and consequently whose manner of life—are of varied character, structural variations not unlike those of *D. tisboides* are not unfrequently to be found.

The following remarks of Dr. Claus, with reference to a species of a closely allied genus, are of much interest:—"The stronger, and, on the average, the larger form of *Harpacticus nicæensis* has a heavy, strong body—ill-bred apparently, inactive, and want-

ing in mobility; the antennæ clumsy, with their third and fourth joints short and thick, the second joint very long; the second foot-jaw ends in a strong, massive, clasping hand; the first pair of feet are armed with doubly-curved claws; the feet, especially the last pair, are strong and clumsy, all the setæ showing a tendency to become plumose. The smaller and slenderer breed has larger antennæ, the third and fourth joints of which are much elongated; the prehensile apparatus of the foot-jaws and first pair of feet more slender, and there is also a much slimmer, slenderer form of the limbs. In general structure and conformation of body, in the peculiar arrangement of setæ, the serration of the abdominal segments, in short, in those points where distinct species mostly diverge, there is here a striking agreement. . . . After diligent inquiry, these differences remained unexplained, and I was inclined to consider them as mere individual variations. But further investigation of all parts of the body convinced me that two distinct forms, with qualities diversely useful, had originated two separate races, one slender, swift, and agile, the other clumsy in figure, but robust and powerfully armed. The two races are so far separate that intermediate individuals partaking of the characters of both are not met with. The upper antennæ, however, in each case show a tendency to similar variations; at the same time these variations are not so profound that they might not have been acquired singly or in combination. The differences in the relative size of the claws and prehensile organs may be traced back

to the youngest stages of growth. . . . Many species may, no doubt, have been founded on characters no more distinct than these, and on mere deviation of character in the joints, which a critical investigation would prove to be worthless."* It may be noted that many of the peculiarities here pointed out by Dr. Claus—especially the strong, doubly-curved claws of the first feet in the stronger, and the very slender simply-curved claws in the weaker form—have their exact counterparts in the two varieties of *D. tisboides* here described.

2. DACTYLOPUS SIMILIS, Claus. Pl. LV, figs. 14—16.

Dactylopus similis, Claus. Die Copepoden-Fauna von Nizza, p. 25, taf. ii, figs. 29, 30 (1866).

This species differs little from *D. Stromii* except in the proportionate lengths of the various antennal joints, the length of the rostrum, and some other minor points. The rostrum is very long and curved, and the relative lengths of the joints of the anterior antenna (fig. 14) may be expressed (allowing some latitude for individual variation) as follows :

1,	2,	3,	4,	5,	6,	7,	8.
20	12	8	8	3	5	2	7

The lower foot-jaw, the first and all the following pairs of feet differ scarcely at all from the same organs

* Die Copepoden-Fauna von Nizza, Ein Beitrag zur Charakteristik der Formen und deren Abänderungen, "im Sinne Darwin's," von Dr. C. Claus, Marburg und Leipzig, 1866.

in *D. Stromii*. The setæ of the fifth feet (fig. 16) are, however, more irregular in length than in *D. Stromii*. Length $\frac{1}{8}$ th of an inch (.9 mm.).

A few specimens which I refer to this species were dredged off Portincross, Ayrshire, in a depth of fifteen fathoms, but notwithstanding the careful examination which Dr. Claus has bestowed upon it, with the result of separating it specifically from *D. Stromii*, I must confess myself unable to see the propriety of that step. The preferable course would, I think, be to consider the present as a well-marked variety of what must be admitted to be a variable species.

3. DACTYLOPUS STROMII, Baird. Pl. LV, figs. 1—13.

Canthocamptus Stromii, Baird. Brit. Entom. p. 208, pl. xxvii, fig. 3 (not *Canthocamptus Stromii* of Lilljeborg) (1850).

Cyclops — Baird. Mag. Zool. and Botany (1837).

Nauplius — Phillippi. Archiv für Naturgesch., p. 69 (1843).

Dactylopus cinctus, Claus. Die Copepoden-Fauna von Nizza, p. 27, taf. iii, figs. 8—12 (1866).

Rostrum long and curved; anterior antennæ 8-jointed, slender, plentifully beset with not very long hairs; the fourth joint bearing a long, curved, rod-like "olfactory" appendage (fig. 1 *a*), the first four joints (peduncle) stouter than the rest, last joint long and slender; in the *male* (fig. 2) the first, second, and fourth joints are tumid, the third small and narrow, and there

is a hinge between the fifth and sixth. Inner branch of the posterior antennæ (fig. 3) 3-jointed; mandible-palp (fig. 4) large and strongly setose; maxillæ (fig. 5) strong, with a well-developed palp; anterior foot-jaw (fig. 6) 4-digitate; posterior with a slenderly ovate hand, which has a long plumose seta on the inner and three short ones on the outer margin (fig. 7). Inner branch of the first foot about twice as long as the outer; first joint very long, second scarcely as long as broad, third about twice as long as the second, and bearing two slender, slightly curved, terminal claws; the first joint has a strong apical seta, and is ciliated along the inner margin; the second joint of the outer branch is rather larger than the first and about twice as long as the third; the margins of all the joints of the outer branch bear long apical spines and pectinate rows of stout setæ (fig. 8). The second, third, and fourth pairs have the joints more or less angulated at the distal extremities (fig. 10), and those of the outer branches are strongly spined; the terminal joints considerably longer than the others. The second pair in the *male* is only 2-jointed, the last joint (fig. 9) being reduced to a broad, lancet-shaped spine (fig. 9 a) and a digitiform segment, which bears three setæ. The fifth pair in the *female* (fig. 11) has a broad basal joint, produced internally, with ciliated margins and five long setæ; the outer joint is broadly ovate, ciliated internally, and bearing six large marginal setæ. In the *male* both lobes are much smaller, and the inner one (fig. 12) has only two terminal setæ. The caudal segments (fig. 13) are very short, the setæ of

moderate length and imperfectly ringed (fig. 13 a), their structure appearing under high powers of the microscope somewhat like that of wool or human hair. Length $\frac{1}{45}$ th of an inch (1 mm.).

This is a widely distributed and very distinct species, with a slender, tapering abdomen, which in preserved specimens is usually only slightly bent upon the thorax ; the colour is usually pale or golden yellow, and the animal is frequently filled with small oil globules, a character often sufficient to distinguish it at once amongst other species. Some doubt must rest upon the identification of this with Dr. Baird's *Canthocamptus Stromii*, but as I am unable to suggest any other species to which Dr. Baird's description might better apply, I follow the nomenclature adopted by Dr. Claus and Mr. Norman.

The habitats given by Dr. Baird are : "Sea-shore at Cockburnspath, Berwick, &c., amongst coralline and seaweeds, 1835. Dover, North Foreland, September 1849." No one, however, so far as I know, has found the species in these localities since Dr. Baird, nor has it occurred (except in one instance) in any of the numerous gatherings from different parts of the East Coast which have passed through my hands. Mr. Norman has recorded it from Lerwick ; I have specimens taken at Ventry Bay, Valentia, and Killybegs Harbour, Ireland, by Mr. E. C. Davison ; and it has been dredged by Mr. Robertson and myself off Redcliff, Yorkshire ; off Port Dinlleyn, North Wales ; in Clew Bay, and amongst the Scilly Islands, where also, as well as in the Frith of Clyde, near Cumbræ, we

took it by means of the surface-net. I am unable to find any characters which distinctly separate *Dactylopus cinctus*, Claus, from robust forms of *D. Stromii*, and have frequently seen specimens which, so far as I can ascertain, might be referred equally well either to one species or the other.

I am disposed to think that a form described by me some years ago, under the specific name "*Normani*," may very probably belong to *D. Stromii*. For the present, at any rate, it seems best to withdraw the name, which can be re-established should further research prove the species to be well founded. The following is the description of *D. Normani* :*

"Closely approaching *D. tisboides*, from which it differs, however, in the following particulars :—The superior antennæ are 8-jointed, and not so densely setose, the proportionate lengths of the various joints being as follows :

1,	2,	3,	4,	5,	6,	7,	8
6	5	4	5	2	2	2	4

The secondary branch of the lower antennæ bi-articulate, each joint bearing two moderately long setæ. Lower foot-jaw (gnathopod) simply chelate, the inner margin of the hand fringed with short setæ. Longer branch of the first foot slender, bearing almost at the extremity of the outer margin a short ciliated seta. Fifth pair of feet large, outer branch subovate, bearing three long setæ, one at the apex, one on each lateral margin, and three shorter ones on the outer margin

* 'Nat. Hist. Trans. Northumberland and Durham,' vol. iv, 1872.

between the apical and lateral setæ; inner branch very much smaller, subquadrate, extending only half the length of the outer, bearing four primary setæ, two of them long and two of moderate length, the interspaces being densely ciliated.

“*Hab.*—Roker, on *Laminaria saccharina*; rare.”

4. *DACTYLOPUS TENUIREMIS*, *Brady and Robertson*. Pl. LVI, figs. 12—18.

Dactylopus tenuiremis, *Brady & Robertson*. Brit. Assoc. Report, p. 197 (1875).

Rostrum of moderate length, slender; anterior antennæ very slender (fig. 12), about as long as first body segment; first four joints (or peduncle) stouter than the flagellum; second and fourth joints much the longest, about equal in length to the last three; inner branch of posterior antenna 2-jointed. Inner branch of the first foot (fig. 16) nearly as in *D. Stromii*; outer branch rather more slender. Basal joint of the fifth foot (fig. 17) broad, triangular, bearing a row of five long setæ from the apex to the middle of the inner margin; outer joint ovate, about as long as the basal joint, its inner margin ciliated, outer margin and apex fringed with eight setæ, the longest of which are at the apex. Tail setæ (fig. 18) short, dilated at the base, the longest about as long as the abdomen. Length $\frac{1}{40}$ th of an inch (.63 mm.).

Apparently a rare species; found hitherto only

sparingly in the undermentioned localities off the coasts of Durham and Yorkshire. In forty-five fathoms twenty miles off Sunderland, amongst muddy sand, and in thirty to thirty-five fathoms off Robin Hood's Bay, Staiths, and Red Cliff.

Allied to *D. longirostris*, Claus, and *D. minutus*, Claus, as well as to *D. Stromii*, Baird, but differing from these, especially in the structure of the antennæ, the first and fifth pairs of feet, and the tail setæ.

5. *DACTYLOPUS FLAVUS*, Claus. Plate LVI, figs. 1—11.

Dactylopus flavus, Claus. Die Copepoden-Fauna von Nizza, p. 28, taf. iii, figs. 13—16 (1866).

Body depressed, robust; abdomen short and broad; the second, third, and fourth segments—and in the *male* the first segment also—pectinate on the posterior margins; rostrum rounded off. Anterior antennæ 6-jointed, much shorter than first body segment, joints subequal (fig. 2); in the *male* (fig. 3) the fourth joint forms a vesiculiform swelling. Inner branch of posterior antenna 2-jointed. The hand of the second foot-jaw (fig. 4) is long and slender, ciliated on the inner margin and provided with one large seta, one also at the apex of the preceding joint. The outer branch of the first swimming-foot has the middle joint scarcely at all larger than the other two (fig. 5), the entire length of the branch being less than that of the first joint of the inner branch; the apical spines of the first and

second joints are exceptionally long and are pectinate on the outer margin; the last joint bears at its extremity five geniculated setæ; first joint of the inner branch robust, giving origin near the middle of the inner margin to a very long plumose seta; second and third joints equal, about as long as broad, the second bearing two slender terminal setæ. In the *male* the first joint is excessively broad (fig. 6), and just within its point of attachment is a stout lobe (fig. 6 *a*) with a curved spine and two or three small hairs. The inner branches of the following pairs of feet are considerably shorter than the outer. The fifth pair is of moderate size, the basal joint short and broad (fig. 8), its internal segment not much produced, fringed with a few short hairs and five setæ of moderate length; the second or outer joint is small, about as long as broad, and is also provided with five setæ. In the *male* the basal joint is less developed (fig. 9) and has only two setæ, but the second joint is larger, more angular, and bears five strong spine-like setæ on the outer, and one of more slender build on the inner margin. The tail segments in the *female* (fig. 10) are rather longer than broad, bearing three setæ, the innermost of which is the longest, but scarcely equals the length of the abdomen; in the *male* (fig. 11) the last abdominal ring is also partially divided, forming a portion of the caudal fork; the tail setæ are considerably dilated towards the base, and the inner angle of the caudal segment gives attachment to a narrow lancet-shaped spine (fig. 11 *a*). Colour yellowish brown. Length $\frac{1}{4}$ nd of an inch (.6 mm.).

This very well-marked species has occurred amongst dredged material from several places, but except at Red Cliff, where several examples were found, it seemed to be extremely scarce. The following are the localities:—In twenty-seven fathoms off Hawthorn, Durham; thirty to thirty-five fathoms off Staiths, Red Cliff, and Robin Hood's Bay, Yorkshire; Clew Bay, Ireland; off Callum's Hole, Bute, sixteen fathoms; Oban, twelve to sixteen fathoms (*Rev. A. M. Norman*).

6. *DACTYLOPUS BREVICORNIS*, *Claus.* Pl. LVII, figs. 10
—12; Pl. LVIII, fig. 14.

Dactylopus brevicornis, Claus. Die-Copepoden-Fauna von Nizza,
p. 29, taf. iii, figs. 20—25 (1866).

Body elongated; abdomen short and broad; rostrum of moderate length. Anterior antennæ (fig. 10) excessively short and stout, thickly clothed with hairs, five-jointed; fourth joint short, fifth more than twice as long and more slender. Inner branch of posterior antenna 3-jointed. Mouth organs very similar to those of *D. tisboides*. Lower foot-jaw short and stout (fig. 11), the hand somewhat oblong-quadrangular and bearing a stout, curved, terminal claw. Both branches of the first pair of feet short and (Pl. LVIII, fig. 14) nearly equal in length; first and second joints of the outer branch equal, twice as long as the third, which is extremely short, truncate at the extremity, and bearing five strong curved setæ, increasing gradually

in length from without inwards; the inner branch is stout, with two stout, curved, terminal claws, and one long, plumose, marginal seta. The fifth foot (Pl. LVII, fig. 12) has a stout and broad basal joint, the inner segment of which bears five setæ of unequal length; the second joint is of moderate size and has about six unequal setæ and a few small marginal hairs. Length $\frac{1}{3}$ rd of an inch (1.1 mm.).

Mr. Norman has taken this species at Oban, and on the fronds of *Laminariæ* at Tobermory, and I have myself found it not uncommonly on *Laminaria saccharina* at Sunderland; Mr. Robertson has dredged it in a depth of two to three fathoms off Douglas, Isle of Man, and it occurred also in dredged material got by Mr. Robertson and myself amongst the Scilly Islands, in depths of twenty to forty fathoms.

The extremely short, somewhat conical, and densely setose antennæ distinguish this species at a glance from any other with which I am acquainted.

7. DACTYLOPUS MINUTUS. Plate LXVII, figs. 12—14.

Dactylopus minutus, Claus. Die frei lebenden Copepoden, p. 126, taf. xvi, figs. 14, 15 (1863).

Body very slender; rostrum long. Anterior antenna (fig. 12) elongated, slender, 9-jointed; second and fourth joints much the longest; last five joints (flagellum) more slender than the rest and subequal. Outer branch of the first foot (fig. 13) slender, about two thirds as long as the first joint of the inner branch;

inner branch ciliated on the upper half of the inner margin, but destitute of long setæ; terminal claws two, long, slender, and only slightly curved. "On the lower borders of the four last body segments, and, in the female, also on the line between the first and second abdominal segments, a row of minute teeth. The last abdominal segment shorter than the preceding; the caudal segments very short and broad; the inner tail seta longer than the abdomen, the outer scarcely half as long. Two ovisacs."—*Claus*.

My observations of this species have not been so full as might be wished, owing to a scanty supply of specimens. Possibly it ought to come under Boeck's genus *Diosaccus*; but I have no doubt whatever of the identity of my specimens with *D. minutus*, Claus. They occurred very sparingly in a tow-net gathering, taken at dusk, in Westport Bay, Ireland.

Genus 25. THALESTRIS, Claus (1863).

Body slender and elongated, or broad and depressed. Anterior antennæ 9-jointed (sometimes 8- or 6-jointed, Boeck). Inner branch of posterior antennæ 2- or 3-jointed. Mandible-palp large, 2-branched, the inner branch usually the largest. Masticatory portion of the maxilla provided with numerous strong teeth; palp large, its terminal segment usually armed with a large claw; lateral segments sometimes reduced to a few bristles. First pair of foot-jaws ending in a strong

claw, and bearing three or more setiferous marginal lobes. Second pair forming a strong prehensile hand. Both branches of the first pair of feet form strong prehensile organs with terminal claws, and are 3-jointed; first joint of the inner branch much elongated, second and third very short; first and third joints of the outer branch short, the middle joints greatly elongated. The second, third, and fourth pairs have both branches 3-jointed, and adapted for swimming, except in the second pair of the male, where the inner branch has the third joint wanting or very much reduced in size, and converted into two or three strong spines. Fifth pair of feet 2-branched, foliaceous; both branches in the male usually much reduced in size, the inner often almost obsolete. Ovisac single.

1. THALESTRIS MYISIS, *Claus.* Pl. LVIII, figs. 1—13.

Thalestris mysis, Claus. Die frei lebenden Copepoden, p. 130, t. xviii, figs. 12—16 (1863).

— — Boeck. Oversigt Norges Copepoder, p. 44 (1864).

Body elongated, slender; abdomen very long, the first two segments much longer than the rest; rostrum of moderate size, sharp and slender. Anterior antennæ (fig. 2) 9-jointed; the first four subequal and considerably longer than the following joints. Inner branch of the second pair of antennæ 2-jointed (fig. 4), armed with stout setæ. Mandible-palp well developed and strongly setose (fig. 5); maxilla also

largely developed (fig. 6). The first foot-jaw (fig. 7) is strong, having a long apical claw and three setiferous marginal segments; second foot-jaw (fig. 8) slender, the hand somewhat angulated on the outer margin and bearing a long terminal claw. First pair of feet (fig. 9) elongated, both branches of equal length; outer branch terminating in four claws and bearing a short spine in the middle of the outer margin; first joint of the inner branch very long, expanded towards the base, ciliated along the outer, and having a small plumose seta attached to the middle of the inner margin; last two joints very small and terminating in two or three curved setæ. The joints of the three following pairs of feet are angular, dilated towards the apices, and ciliated on the outer border, while the common basal segment bears a comb-like series of six teeth on its inner angle (fig. 11 *a*). The inner branch of the second pair in the *male* (fig. 10) has its second joint much narrowed and produced at the apex, forming an abortive third joint (fig. 10 *b*), which bears an apical spine and two long plumose lateral setæ, while springing from its base on the outer side are three stout spines (fig. 10 *c*), one of which is short, the other two long and sinuous. Fifth pair of feet, in the *female*, very large and foliaceous (fig. 12), the segments of nearly equal size; outer segment ovate; margins finely ciliated beyond the middle; apex obliquely truncate and emarginate, and fringed with seven short setæ; inner segment somewhat triangular, with rounded broad apex, which bears four short hairs and a row of minute cilia, also a short

seta towards the middle of the inner border; in the *male* the outer branch is much longer than the inner (fig. 13), bearing three stout spines and two setæ, while the inner portion of the basal joint has only two spines, one of which is very small. Caudal segments as long as the last abdominal ring; inner setæ longer than the abdomen, outer scarcely half that length. The whole integument of the animal has a corrugated or waved appearance, this being especially conspicuous in the fifth pair of feet of the female. Length $\frac{1}{18}$ th of an inch (1.8 mm.).

A very fine and well-marked species, apparently local in its distribution, but sometimes occurring in moderate abundance. I have specimens from the undermentioned localities:—Westport Bay, Ireland, taken in dredge and tow-net, but rare; also in Roundstone and Clifden Bays; Scilly Islands, dredged in ten to twelve fathoms, and taken in the surface-net and amongst weeds at low water; dredged in a depth of five fathoms at Oban, and found also on the fronds of *Laminaria* at Tobermory (*Rev. A. M. Norman*).

2. THALESTRIS HELGOLANDICA, *Claus.* Pl. LXI, figs. 9—14.

Thalestris helgolandica, *Claus.* Die frei lebenden Copepoden, p. 131, t. xvii, figs. 12—21 (1863).

Body robust; abdomen short; rostrum broad and of moderate length. Anterior antenna (fig. 9) elongated,

slender, 9-jointed; inner branch of the posterior antenna broad, 3-jointed (fig. 10). Basal joint of the mandible-palp almost quadrate. Hand of the second foot-jaw almost exactly like that of the preceding species (fig. 11). Branches of the first pair of feet (fig. 12) elongated, the inner rather the shorter. Basal joint of the fifth pair of feet in the female broad, triangular, its inner segment (fig. 14 a) tapering to the apex and bearing four setæ of moderate length; outer segment narrow, hastate, with ciliate margin and short terminal seta; second joint elongate-ovate, margin ciliated, setæ six, four moderately long, two short. Last three abdominal segments short; tail segments broad and short. Length $\frac{1}{2}$ nd of an inch (1.1 mm.). Male unknown.

Beside the general build, which is quite different from that of the foregoing species, *T. helgolandica* is well separated from all others by the characters of the fifth pair of feet; these, taken together with the 3-jointed inner branch of the second antenna and the absence of a rugose epidermis, form sufficient diagnostic marks. It seems to be one of the rarer British species. The Rev. A. M. Norman has found it at Oban and in Bressay Sound, Shetland. I have myself dredged it off the Durham Coast, in a depth of twenty-seven fathoms, very sparingly, and in rather more abundance off Port Dinlleyn, Carnarvonshire, in ten fathoms.

3. THALESTRIS RUFOCINOTA, *Norman* (M.S.). Pl. LVII,
figs. 1—9.

Body elongated, slender; rostrum very long, curved and sharp; anterior antennæ 9-jointed, the first joint nearly as long as the following three; inner branch of the posterior antenna 2-jointed. Mouth organs large and well developed; second foot-jaw (fig. 4) very similar to those of the two preceding species; first joint setose on the outer margin; inner margin of the hand finely ciliated, nearly straight, and bearing a short seta over the middle; outer margin angulated and also provided with a short median seta; terminal claw long, slender, and having three slender setæ attached near the base. First pair of feet (fig. 5) stronger and more powerfully clawed than in *T. mysis*, but otherwise very similar; inner branch of the second pair in the male (fig. 6) indistinctly 3-jointed, the last two joints being imperfectly separated; apex armed with one short crooked spine and two short setæ; the spines of the outer branch in all the swimming-feet have strongly aculeate margins (fig. 6 *a a*). Inner segment of the basal joint of the fifth foot in the *female* (fig. 7) elongated, subtriangular, bearing five setæ on the inner margin; second joint ovate; distal half of the outer margin four times indented and bearing six setæ of unequal lengths; the margins of both joints densely ciliated; in the male (fig. 8) the basal joint is broad, its inner segment convex, but only

slightly produced and armed with three spine-like setæ; second joint triangular, beset with five or six setæ on the outer, and one near the apex of the inner margin. First two joints of the abdomen (fig. 9) very wide and fringed with small cilia; the second joint produced downwards into two broad triangular processes (*b b*), third joint forming two similar but smaller projections (*c c*); all the abdominal joints, as well as the caudal segments, very short and broad. Length $\frac{1}{35}$ th of an inch (1 mm.). Colour yellowish, more or less banded with deep crimson, the parts of the body which exhibit the colouring being usually the second and third thoracic segments and two or three of the median joints of the upper antennæ, but the bases of the limbs, tail, &c., are liable to partake in the red colouring.

This is a widely distributed species, and sometimes occurs in considerable abundance; it is readily distinguished from all other species of *Thalestris* by the aculeate character of the spines of the swimming-feet. It has occurred sparingly in dredgings from the coast of Durham and Yorkshire—off Marsden, ten fathoms, Hawthorn, twenty-seven fathoms, and Red Cliff, thirty-five fathoms; Scilly Islands, ten to twelve fathoms, and also on algæ in Porcressa Bay, St. Mary's; dredged off Cumbræ and Portincross, Firth of Clyde; Port Dinlleyn, North Wales; Clew Bay and Lough Swilly, Ireland; plentiful on fronds of algæ in Mulroy, Clifden, Birtirbuy and Ventry Bays; Oban (*Rev. A. M. Norman*).

4. THALESTRIS HARPACTOIDES, *Claus.* Pl. L, figs. 9—16;
and Pl. LIX, fig. 1.

Thalestris harpactoides, *Claus.* Die frei lebenden Copepoden,
p. 133, taf. xix, figs. 2—11 (1863).

Body very slender and elongated, subsigmoid in outline; abdomen scarcely at all narrower than the cephalothorax; each segment bordered by a more or less distinct belt; rostrum of moderate size, slender; anterior antenna (fig. 9) 9-jointed, slender; inner branch of lower antenna 2-jointed. Second foot-jaw (fig. 12) slender; hand elongated, ovate, much like that of *T. rufocincta*, but the terminal claw is devoid of basal setæ, and is only 1-jointed. Mouth organs and first pair of feet also like those of *rufocincta*, but the marginal setæ of inner branch longer. The fifth pair of feet in the *female* have a large, broadly triangular basal joint (fig. 14) with ciliated inner margin, and five setæ of moderate length; second joint broadly oval, ciliated, obliquely truncate, and dentate distally, bearing six setæ, not much longer than the first joint; fifth feet of the *male* (fig. 15) almost exactly like those of *rufocincta*. Abdominal segments (fig. 16) short and wide, ciliated laterally, the first two scarcely wider than the rest, and not produced into lateral angles; posterior margins of the last two segments finely dentate; the second segment has also two spine-like appendages (*aa*). Caudal segments about as long as broad, armed with a small spine on the outer angle; tail setæ rather short, the inner one about as long as

the abdomen and finely aculeate. Length $\frac{1}{3}$ rd of an inch (1.1 mm.).

One of the less common British species. I have scarcely ever myself taken it, but am indebted to my friend, Mr. E. C. Davison, of Sunderland, for surface-net gatherings in which it occurred, from Grimsby, Teesmouth and Killybegs. The Rev. A. M. Norman mentions it as found "at Hillswick, Shetland, among weeds;" and I have a single specimen, apparently belonging to the same species, which was dredged amongst the Scilly Islands. It occurs also in gatherings of Copepoda, made by the Rev. A. M. Norman, between tide-marks at Oban, and in material dredged in a depth of five fathoms at the same place.

5. *THALESTRIS CLAUSII*, Norman. Pl. LXII, figs. 1—12.

Thalestria Clausii, Norman. Brit. Assoc. Report, p. 297 (1868).

Parathalestria Clausii, Brady and Robertson. Ann. and Mag. Nat. Hist., vol. xii, p. 136 (1873).

Animal robust, stout and heavy in all its parts; rostrum short and blunt, not as long as first antennal joint; anterior antenna of the *female* (fig. 2) 9-jointed, gradually tapering to the apex; third and fourth joints of the *male* antenna constricted, the fifth swollen and forming the base of the conical distal half of the limb (fig. 3). Secondary branch of the posterior antenna 2-jointed. Branches of the mandible-palp (fig. 4) two, one small and bearing a single setæ, the other larger

and profusely setose. Maxilla (fig. 5) strongly clawed, the lateral segments of the palp well developed (*a, a*); anterior foot-jaw (fig. 6) stout, its lateral segments stout and bearing short claw-like setæ. Posterior foot-jaws (fig. 7) large and broad; hand broadly ovate, its inner margin nearly straight, outer strongly convex; proximal half of the inner margin finely ciliated and bearing a single spine-like seta near the middle—the outer margin has also a few fine cilia; terminal claw stout, shorter than the hand, and bearing two fine setæ near the middle. Branches of the first pair of feet (fig. 8) very stout, nearly equal in length, and smooth on the inner margin, which has only one short seta near the middle; upper half of outer edge of the inner branch strongly ciliated; last two joints very short, with two sub-equal terminal claws; the outer branch has three strong terminal claws, and a short seta, its whole external margin densely ciliated; peduncle bearing at the external angle a ciliated lanceolate spine; first and second joints each with an apical spine; the three following pairs of feet are short and thick; inner branch of second pair in the *male* 2-jointed, the second joint produced into a narrow apical portion and armed with one very short and two long spines (fig. 9). Fifth pair in the *female* short, the two joints nearly equal in length (fig. 10), the outer broad, sub-ovate, ciliated, and bearing six short setæ on the apical portion; inner joint sub-triangular, five short setæ on the distal half of the inner margin, the first of which is plumose. The fifth pair of the *male* (fig. 11) has the outer branch

longer than the inner, short and broad, four setæ on the outer margin, one long plumose apical seta, and one short seta on the inner margin; inner branch bearing three strong, sub-equal, spine-like setæ; caudal segments short and broad; internal seta as long as the abdomen, external about half as long; in the female swollen at the bases, but not so in the male.

Length $\frac{1}{2}$ nd of an inch (1.1 mm.).

Thalestris Clausii was described by the Rev. A. M. Norman from specimens found "amongst Laminariæ in Bressay Sound, 1867; and also at Tobermory, in the Isle of Mull, in 1866." It occurs also in gatherings made recently by Mr. Norman at Oban. It is, in fact, one of the commonest, perhaps *the* commonest, British species of *Thalestris*, often occurring plentifully in the littoral zone amongst weeds, and not unfrequently in the open sea, where it is taken by the surface-net. In such situations I have found it frequently on the Northumberland and Durham coasts; in Birtirbuy, Clifden, and Westport Bays (Ireland), the Scilly Islands, and Cumbrae (Firth of Clyde).

The characters, on the strength of which this species was separated from the rest of the genus, are certainly insufficient; I therefore here return to the old generic term.

6. THALESTRIS RUFO-VIOLASCENS (?), Claus. Pl. LXI,
figs. 1—8.

Thalestris rufo-violascens, Claus. Die Copepoden-Fauna von
Nizza, p. 33, taf. iv, figs. 18—22
(1866).

Body of the *female* robust; first four segments much wider than the rest and produced laterally into projecting angular processes; body-segments bordered with chitinous bands and marginally ciliated, rostrum broad and short. Anterior antennæ 9-jointed, the proportionate lengths of the joints being as follows: 8, 12, 9, 7, $3\frac{1}{2}$, 4, $2\frac{1}{2}$, $2\frac{1}{2}$, 3. Inner branch of posterior antenna 2-jointed. Mandible and palp (fig. 3) strong and well developed; first foot-jaw (fig. 4) having a stout terminal claw and three digitiform marginal segments; second foot-jaw (fig. 5) very large and stout, hand very broad, its inner margin straight, and having two rows of short spine-like cilia extending along its whole length, outer margin excessively convex; claw strong and very much curved, with a single accessory curved seta on the inner margin. First pair of feet (fig. 6) robust, branches sub-equal, margins smooth, terminal claws extremely long, joints of the outer branch in the second, third, and fourth pairs of feet contracted at the bases (fig. 7), first joint much expanded at the apex, its inner angle truncate and giving attachment to a long seta, second joints somewhat similar but less prominent; outer border of the first joint ciliated and bearing a strong apical

spine, that of the second joint beset with a series of six short spines, and one large spine at the apex; last joint fringed with six spines which increase in length from the first to the last, the last being very long and plumose. Fifth pair large, both joints nearly equal, the inner large and sub-triangular, the outer broadly ovate (fig. 8), both joints bordered by wide chitinous plates; on the inner joint six spine-like apical setæ—three long and three short; on the outer also six setæ, three of which are much more slender than the rest; inner margin ciliated. Caudal segments broader than long, fringed with numerous short, spine-like cilia; inner tail-seta dilated at the base, much shorter than the abdomen; outer about half as long.

I have some doubt whether the species here described is rightly referred to *rufo-violascens*, Claus, but if not so it must be very closely allied to that species. The most conspicuous characters are the very strongly arched and clawed foot-jaw, the peculiar form of the joints of the outer branches of the swimming-feet, the large chitin-bordered fifth foot, and the general outline of the whole animal. This seems to be a very rare species in Britain. I have seen only very few examples,—two from Mr. Norman's washings of Laminariæ in Shetland, and two or three washed off weeds dragged up near the "Allans," Cumbræ (Firth of Clyde).

7. THALESTRIS SERBULATA, *nov. sp.* Pl. LIX, figs. 2—11.

Male.—Body elongated, of nearly equal thickness throughout, first segment unusually small. Anterior antenna short and robust. Inner branch of posterior antenna 2-jointed. Posterior foot-jaw (fig. 7) very strong, hand broad, sub-quadrate, outer margin strongly arched, inner sinuous and fringed with two separate rows of spine-like cilia, the distal row sub-crescentic and tending inwards towards the middle of the hand; terminal claw stout, falciform, about half the length of the hand; first joint bearing a spine and three or four setæ at the extremity of its inner margin. Outer branch of the first foot much more slender than the inner (fig. 8), terminating in two long, slender spines, and a short seta; outer margin closely ciliated, having a short seta below the middle and one at the apex of the first joint; peduncle armed at the outer angle with a broad plumose seta, and at the inner with a stout curved spine; inner branch very broad, and bearing a seta near the middle of its inner margin, outer margin ciliated, terminal claws two, one long and one short; these, as well as the claws of the outer branch, are closely and finely pectinated on the concave margins; outer margins of all the swimming-feet fringed with spines. Inner branch of the fifth foot (fig. 9) short, broadly triangular, 3-setose; outer branch elongate sub-ovate, inner margin ciliated, outer with three or four short and one long

seta near the base, and four more towards the apex, from which spring three setæ, one much larger than the others. Last abdominal segment very short, tail-segments (fig. 11) about thrice as long, tapering towards the apex and armed with a row of serratures along the greater part of the outer margin. Second foot of the *male* like that of the following species (*T. hibernica*). The limbs are all short, but the first pair of feet are longer than the others. Length $\frac{1}{15}$ th of an inch (1.7 mm.).

I have seen only one specimen—a male—of this species, which was dredged on a bottom of muddy sand in New Grimsby Harbour, Scilly; depth fourteen fathoms. The characters of the posterior foot-jaw and tail-segments are abundantly sufficient to distinguish it from any described species.

8. *THALESTRIS HIBERNICA*, *Brady and Robertson*. Pl. LXII, figs. 13—17, and Pl. LXIII, figs. 14, 15.

Thalestris hibernica, B. & R. Ann. and Mag. Nat. Hist., ser. 4, vol. xii, p. 135, pl. viii, figs. 17—19 (1873).

Body slender, rostrum of considerable length. Anterior antennæ 9-jointed, of moderate length, rather thickly clothed along the anterior margin with shortish hairs; second, third, and fourth joints nearly equal, about twice as long as broad; fifth, sixth, seventh, and ninth also nearly equal, and about half the length

of the foregoing; penultimate joint much smaller. Anterior antennæ of the *male* shorter and swollen, third joint very short and constricted, fourth much the longest and as wide as the two basal joints, armed with a long falciform appendage, fifth and sixth joints about half the length and breadth of the fourth, seventh and eighth very small, last joint as long as the fifth, but very narrow; a few crowded setæ on the margin of the second joint, and three small ones at the apex of the last joint: inner branch of posterior antennæ 2-jointed. Mouth-organs as usual in the genus. Lower foot-jaw (Pl. LXIII, fig. 15) terminating in a slender clawed hand, in shape approaching that of *T. longimana*, the hand being irregularly angular and subcrescentic, with the internal angle slightly setose; the claw strong and well curved. First pair of swimming-feet (Pl. LXII, fig. 14) almost as in *T. longimana*, except that the terminal claws and setæ are longer and more slender, the two branches being nearly equal, and the long claw equal in length to the branch itself. The inner branch of the second pair of feet in the *male* is, as usual, 2-jointed (Pl. LXII, fig. 15), the three terminal spines being uncommonly small and slender (*a*). Fifth pair of feet in the *female* (fig. 16) having both branches of nearly equal length, the inner branch broad, sub-quadrate, and bearing five setæ on the distal extremity, the margins between the setæ ciliated; outer joint smaller, ovate, with six terminal setæ, four of which are small and slender, the apical two being larger. The fifth foot in the *male* (fig. 17) is smaller; inner segment short and broad,

3-setose; outer narrow, quadrate, armed with one long, and four short, terminal setæ. Length $\frac{1}{34}$ th of an inch (1.05 mm.).

This is very similar in many respects to the following species (*T. longimana*); but, besides the less gibbous outline, less vivid colouring and more delicate skin, it differs considerably in several anatomical points, especially in the structure of the fifth pair of feet in both sexes, and the inner branch of the fifth pair in the male. The posterior foot-jaw, though similar in general character to that of *T. longimana*, is much less robust and less angular. *T. hibernica* was taken very sparingly in the tow-net in Westport Bay (Ireland) and rather more plentifully in a gathering off Cumbræ (Firth of Clyde). Oban (*Rev. A. Norman*).

9. *THALESTRIS LONGIMANA*, *Claus.* Pl. LX, figs. 1—13.

Thalestris longimana, *Claus.* Die frei-lebenden Copepoden, p. 130, t. xviii, figs. 1—11 (1863).

Body very robust, cephalothorax much arched dorsally, integument thick and tough, rostrum broad and blunt, body-segments bordered with chitinous marginal bands, which are often deeply coloured, brownish or blood-red, the general colour of the animal being yellowish. Anterior antennæ (figs. 2, 3) 9-jointed, joints of the peduncle long and stout, those of the flagellum short; inner branch of the posterior antenna (fig. 4) 2-jointed, short; mandible (fig. 5) strong, with a large, well-developed palp; maxilla (fig. 6)

rather strongly clawed, the lateral processes of the palp broad and stout. Anterior foot-jaw (fig. 7) strong and numerously segmented; posterior (fig. 8) having a remarkably large and powerful hand, broad at the base, with a serrated or file-like, deeply-concave, inner margin, and shaped much like that of *Harpacticus chelifera*, with a strongly produced angle at the proximal end of the concavity; terminal claw more than half the length of the hand, much curved, stout, and armed with two small accessory spines near the base. First pair of feet (fig. 9) very long and slender, subequal, each branch with only one long terminal claw and one short seta; outer branch bent on the peduncle in a knee-like angle; margins only very slightly ciliated; the second, third, and fourth pairs of feet are successively much shorter; fifth pair, in the *female* very large, at least as long as the first two abdominal segments; the outer branch elongated, subquadrate (fig. 11), bearing five setæ on the distal margin, which is also finely ciliated; inner branch narrower, subovate, margins ciliated and having four setæ on the outer margin and apex. Last abdominal segment very short, tail-segments rather longer; outer tail-seta very short and slender, inner thrice as long, strong, and much dilated at the base. Length $\frac{1}{18}$ th of an inch (1.4 mm.).

A very fine species and one of frequent occurrence, varying much in colour, from a uniform deep brown or red, to a golden yellow with red bands and blotches; otherwise very constant in character. It occurs most frequently in the laminarian and littoral zones amongst

weeds, but is sometimes dredged abundantly, and is also taken by the tow-net in the open sea. On the Durham coast it is not uncommon between tide-marks. (Sunderland, Ryhope, &c.)

I have specimens found amongst dredged material from Portincross (Ayrshire), and in surface-net gatherings taken by Mr. E. C. Davison in the harbours of Valentia and Killybegs (Ireland). I have dredged it abundantly amongst the Scilly Islands, where, also, it was got in the surface-net; dredged also off Scarborough, and in Lough Swilly. Mr. Norman has taken it in Bressay Sound, Shetland, at Oban, and at Tobermory, amongst weeds.

10. *THALESTRIS PELTATA* (Boeck). Pl. LIII, figs. 11—19.

Amenophia peltata, Boeck. Oversigt Norges Copepoder, p. 45 (1864).

Body depressed, broadly ovate; abdomen constricted at the base, and narrower than the cephalothorax. Rostrum short, obtusely rounded. Anterior antennæ 9-jointed (fig. 12); first four joints (peduncle) much longer and broader than those of the terminal portion (flagellum), the first, third, and fourth joints being nearly equal in length, the second almost as long as the third and fourth together. Inner branch of the posterior antenna (fig. 13) 3-jointed. Posterior foot-jaw (fig. 16) slender, hand elongated and bearing a single seta on the middle of the inner margin. Branches of the first pair of feet nearly

equal (fig. 17); first joint of the inner branch having a series of cilia along the proximal half of the inner margin, and a long seta near the middle; two terminal claws on the last joint, which, like the preceding joints, is very short; outer branch densely ciliated along the outer margin, the elongated second joint armed near the middle with a long pectinated spine; the short terminal joint bears five long claws, some of which are finely ciliated. Inner joint of the fifth pair of feet broad and short (fig. 19); margin clothed with short cilia, bearing two long ciliated setæ at the outer angle, and two shorter ones more internally; outer branch elongated, subquadrangular; outer marginal portion hispid, inner margin closely ciliated; apex broad, and armed with several short spines. Lateral margins of the abdominal segments finely aculeate; caudal segments short and broad. The animal (according to Boeck) is of a brown colour, banded with red across the second and third segments of the body, and first and last abdominal rings.

One specimen only was found in dredged material from a depth of forty fathoms off St. Agnes (Scilly).

This species was removed by Boeck from the genus *Thalestris*, on the ground of the eyes being widely separate and placed towards the sides of the head, a character represented in my figure from a drawing kindly sent to me by that lamented naturalist. This ground of generic separation seems to me, however, scarcely sufficient to warrant the breaking up of the older genus, which is not yet so overgrown as to require disintegration on the score of convenience.

Moreover, it is doubtful whether some other species here referred to *Thalestris* (notably *T. rufocincta*) might not also, considering their general conformation, have to accompany *T. peltata* in any generic migration. On these grounds I think it better, for the present, to ignore the genus *Amenophia*. I have not, in my single specimen, been able to observe accurately the position of the eyes, and have therefore, in this respect, as well as in that of colour, simply recorded the statements of M. Boeck.

Genus 26. WESTWOODIA, Dana, 1855.

(*Harpacticus*, in part, Baird.)

Cephalothorax large and robust; abdomen slender. Head and first thoracic ring coalescent; rostrum of moderate size; first pair of antennæ 6-jointed, second pair 2-jointed, with a 2-jointed inner branch. Mandibles elongated, slender; palp consisting of a long, narrow, basal joint, with two small, 1-jointed branches. First foot-jaw stout, provided with a strong terminal claw and three marginal, setiferous digits. Second foot-jaw forming a stout, grasping hand. Inner branch of the first foot 1-jointed, outer branch 3-jointed; the first joint much elongated, second and third joints rudimentary and terminating in two claws. Both branches of second, third, and fourth pairs of swimming-feet 3-jointed; fifth pair foliaceous, two branched,

1. WESTWOODIA NOBILIS, Baird. Pl. LXIII, figs 1—13.

Arpacticus nobilis, Baird. Trans. Berw. Nat. Club, ii, p. 155, 1845; Ann. and Mag. Nat. Hist. xvii, p. 416, t. 9, figs. 5, 5 a, b, c, d (1846); Brit. Entomological Trans., p. 214, tab. 28, figs. 2, 2 a—e (1850).

Westwoodia nobilis, Claus. Die frei-lebenden Copepoden, p. 118, t. 21, figs. 1—9 (1863).

— — Boeck. Oversigt Norges Copep., p. 35 (1864).

Anterior antennæ short, in the *male* 6-jointed (fig. 3), in the *female* 7-jointed, rather stout (fig. 2), third joint much the longest, toothed on its upper edge, last four nearly equal, and altogether scarcely as long as the preceding joint; all the joints setiferous. Inner branch of the posterior antenna (fig. 4) rather large, 2-jointed. Hand of the second foot-jaw (fig. 8) oblong-ovate, having a long spine-like seta near the middle of the inner margin; terminal claw long and slender. The outer branch of the first pair of feet (fig. 9) consists of one joint, which is large, ovate, and bears several marginal spines and setæ; the inner branch is 3-jointed, the first joint being much elongated and having a very long plumose seta near the middle of its inner margin; terminal claw long and slender. The inner branches of the three following pairs of swimming-feet are much shorter than the outer, the first two joints in both branches, but especially in the inner, being unusually broad and angular. The inner branch of the second pair in the *male* is only 2-jointed and has modified spines. Fifth pair of feet of moderate size and not very different in the two sexes, the mar-

ginal setæ in the male being, however, stouter; the inner segment of the basal joint is broad and large, and of about the same length as the outer segment, which forms a subquadrate plate bearing five setæ; the setæ of the inner plate are three in the male (fig. 12) and five in the female (fig. 11). Caudal segments short, about as long as broad (fig. 13). Inner tail-seta longer than the abdomen, outer not much shorter. Length $\frac{1}{7}$ th of an inch (.9 mm.).

Dr. Baird's specimens of *Westwoodia nobilis* were obtained in Berwick Bay, at Dover, and the North Foreland. I have found it rarely on Laminariæ near Sunderland, and in a depth of two fathoms at Cumbræ; on weeds between tide-marks at Roundstone (Galway); Ventry Bay and Mulroy Lough (Donegal), fourteen fathoms; Portincross, Ayrshire, ten to thirty fathoms; also near St. Agnes (Scilly), ten to twelve fathoms. Mr. Norman has noticed it amongst weeds at Oban and at Tobermory (Mull). This, though widely distributed, is one of the less common of the British Copepoda, occurring nowhere in any considerable numbers. Dr. Baird states that the "whole animal is beautifully coloured with green, red, and purple;" this has not been by any means usually the case with such specimens as I have taken; but in those sent to me by my friend, Mr. Norman, from Oban—where it was found amongst weeds between tide-marks—the head, last thoracic somites, and tail are marked with deep brownish red; the eye also is conspicuously large and red.

Genus 27. ILYOPSYLLUS, Brady and Robertson (1873).

Body tumid and gibbous. Anterior antennæ very short, 5-jointed, basal joint greatly dilated; posterior stout, destitute of a secondary branch. Mandibles small, and bearing a simple bisetose palp. First pair of feet stout, and strongly spined, internal branch composed of one, external of three joints, second, third, and fourth pairs having both branches tri-articulate. Abdomen short and tapering towards the extremity; caudal setæ spathulate.

1. ILYOPSYLLUS CORIACEUS, B. and R. Pl. LXXXII,
figs. 1—10.

Ilyopsyllus coriaceus, B. and R. Ann. and Mag. Nat. Hist.,
ser. 4, vol. xii, p. 132, pl. ix, figs. 1—5
(1873).

Body very tumid; seen laterally (fig. 2) the ventral line is almost straight, the dorsal excessively arched, so that the cephalothorax forms almost a semicircle; seen from below (fig. 1), the outline is like that of a spear-head rounded off in front; greatest width situate in the middle, and equal to half the entire length of the body; posterior half abruptly tapered. First cephalothoracic segment very large, forming half the length of the animal. Anterior antennæ (fig. 3) 5-jointed, sparingly setose, very minute, the basal joint

excessively dilated, and produced anteriorly into an overlapping, hood-like beak; posterior antennæ (fig. 5) simple, biarticulate (?), the second joint armed with six strong spines, one of which is very long. Mandibles (fig. 6) extremely small, with a small bisetose palp. First pair of feet (fig. 7) short and thick; internal branch 1-jointed, and bearing two strong terminal spines, one longer than the other; external branch 3-jointed, bearing at the truncated apex of the last joint two spines similar to those of the inner branch, and also two very long curved setæ; second, third, and fourth pairs of feet (fig. 8) having both branches triarticulate and nearly equal, more slender than the first pair, each joint bearing at its apex a subverticillate series of sharp slender spines. Abdominal segments beset round the posterior margins with fine spine-like setæ, the last two cut into rectangular notches. Caudal segments (fig. 10) very small, each bearing one large and two small setæ, the larger ones curved, their anterior halves dilated and spathulate. Colour dark vinous red; skin excessively thick and tough. Length $\frac{1}{8}$ th of an inch (.43 mm.).

The habitat of this remarkable species is amongst black peaty mud and roots of seaweeds at the upper end of Roundstone Bay, near high-water mark, where it was found by Mr. Robertson and myself in 1872. It is to be regretted that our specimens were not noticed until after the mud in which they were taken had been completely dried; had we been able to preserve them in spirit it is probable that more accurate knowledge of the mouth-apparatus and some other

organs might have been obtained. As things stand we have been unable, with the most careful dissection, to find any trace of maxillæ or foot-jaws except (doubtfully) of a very feeble posterior foot-jaw, neither have we seen any trace of a fifth pair of feet. The remarkably short and thick limbs of this little creature, together with its flattened ventral surface, its short, stout, and dilated tail-setæ, and general absence of delicate setose encumbrances, seem to fit it admirably for the sort of locality in which it was found, to which and similar situations it is probably exclusively confined.

Genus 28. HARPACTICUS, Milne-Edwards (1838).

Body elongated, or broad and depressed. Head united with the first thoracic segment; first and second abdominal rings, in the female, coalescent. First pair of antennæ 8- or 9-jointed. In the male the fifth and sixth joints form a vesiculiform swelling. Mandible-palp 2-branched, large. Second pair of foot-jaws strongly developed. Outer branch of the first pair of feet 3-jointed, inner branch 2-jointed, both springing from a large, common, basal joint;* first and second joints of the outer branch elongated, third joint rudimentary; second joint of the inner branch very short; three following pairs of feet with both branches 3-jointed; in the *male* the inner branch of the second pair is modified by having the second joint produced into one or more spines, while in the third

* Both branches 2-jointed, Boeck.

foot the outer branch is converted into a stout clasping organ, which is bent across the inner branch, and had its last joint armed with several strong spines. Ovisac single.

1. *HARPACTICUS CHELIFER* (Müller). Pl. LXV, figs. 1—15; and Pl. LXIV, figs. 19, 20.

(Not *Harpacticus chelifer*, Lilljeborg.)

- Cyclops chelifer*, O. F. Müller. Zool. Dan. Prodr., 2413; Entomostraca, p. 114, taf. xix, figs. 1—3 (1776).
Nauplius — Philippi. Weigmann's Archiv, p. 69 (1843).
Arpacticus — Baird. Brit. Entomostraca, p. 212, t. xxix, figs. 2, 3, 3 a—g (1850).
Harpacticus — Claus. Die frei-lebenden Copepoden, p. 135, t. xix, figs. 12—19 (1863).
 — — Boeck. Oversigt Norges Copep., p. 37 (1864).
 ♀ *gracilis*, Claus. Loc. cit., p. 135, taf. xix, fig. 20.
 ♀ — *elongatus*, Boeck. Oversigt Norges Copep., p. 38 (1864).

Body elongated, slender, cylindrical, rostrum rather long and curved, reaching beyond the first joint of the anterior antenna. Anterior antennæ (Pl. LXV, fig. 2) elongated, slender, 9-jointed, third and fourth joints longer than the first two, fifth joint short, sixth nearly twice as long, last three very small. Anterior antenna of the male hinged between the fourth and fifth joints, the next two joints forming a corrugated vesiculiform swelling, and terminating in a crooked, claw-like appendage. Inner joint of the posterior antenna (fig. 4) 2-jointed. Mandibles (fig. 5) broad and strong, basal joint of the palp large, and giving attachment to two slender and nearly equal

setiferous branches. Maxillæ (fig. 6) well developed, bearing two marginal, subovate, setiferous lobes, and several digitiform clawed processes. Posterior foot-jaw (Pl. LXV, fig. 8; and Pl. LXIV, fig. 19) having a very strong subtriangular hand, the outer margin of which is strongly convex, while the inner is produced near the middle into an angular promontory, beyond which it is deeply excavated; the angle is strongly toothed or spined, and the teeth are continued, though of smaller size, along the concave portion of the hand; the apex gives attachment to a large falciform claw, and the distal portion of the concave margin bears one, or sometimes two, smaller claws. Outer branch of the first foot elongated, the first joint marginally ciliated, the cilia being arranged either in a continuous series (fig. 9) or in three separate groups (fig. 10), second joint ciliated in the middle, and having one rather longer seta at the distal end of the row; apex 3-clawed, inner branch about half as long as the outer, and armed with two terminal claws. The inner branch of the second foot in the *male* (fig. 11) has the outer angle of the median joint produced downwards into a long bayonet-like spine, which is about three times as long as the small and almost obsolete third joint. Outer branch of the third foot of the *male* (Pl. LXIV, fig. 20) curved, and armed at the apex with three strong spines. Fifth pair of feet (Pl. LXV, figs. 12, 13) consisting of an ovate outer, and a broad, sub-quadrangle inner (or basal) joint; the inner portion of the basal joint bears about five plumose setæ of irregular size, and its outer portion is more or less

ciliated; the external ovate joint is fringed with cilia, and bears also five ciliated apical setæ of unequal length; in the *male* (fig. 14) the basal joint is obsolete, and the outer plate, though more angular, is very similar to that of the female. The second and third abdominal rings (fig. 15) are denticulated along the hinder border and at the angles. Caudal segments very short and broad. Inner tail seta about twice as long as the outer, and finely aculeate beyond the middle. Length $\frac{1}{8}$ th of an inch (.98 mm.).

This fine species is of common occurrence in the littoral and laminarian zones, and is likewise frequently taken by the dredge, and by the towing-net in the open sea. Different examples vary very much in amount of setiferous and spinous armature (especially in the fifth pair of feet) as well as in slenderness or robustness of build, and it seems to me that it is on mere degrees of variation in these respects that the species *gracilis*, Claus, and *elongatus*, Boeck, have been founded. I have often met with examples which might have been referred to one or other of these species, but have been unable to find any permanent and trustworthy diagnostic mark separating them from the typical *H. chelifer*. I therefore prefer to consider the two as varieties only. The foot, represented in Plate LXV, fig. 10, and the foot-jaw in fig. 8, are, I believe, well-marked examples of those organs in the *gracilis* form, specimens of which from the Mediterranean Professor Claus has been good enough to send me. It is, however, only right to add that Dr. Claus has examined the subject with great care, comparing specimens from widely separated

localities, and appears to be convinced of the specific distinctness of his *H. gracilis*.

It is scarcely needful to note the numerous localities from which I have memoranda of the occurrence of this species. I have found it in many places on the coasts of Durham and Northumberland, as well as in Galway, Mayo, the Scilly Islands, and the Firth of Clyde. Mr. Norman also notes its occurrence at Tobermory in the Island of Mull.

2. HARPACTICUS FULVUS, *Fischer*. Pl. LXIV, figs. 1—11.

Harpacticus fulvus, *Fischer*. Beiträg. zur Kenntniss der Entom. (Abhandl. der König. Bayer. Akad., Bd. viii, p. 656, t. i, figs. 30—33; t. ii, figs. 34—39 (1860).

- *chelifer*, *Lilljeborg*. De Crustaceis ex ord. trib., p. 200, tab. xxii, figs. 2—11 (1853).
- *crassicornis*, *Brady and Robertson*. Brit. Assoc. Report, p. 196 (1875).
- *curticornis*, *Boeck*. Oversigt Norges Copepoder, p. 38 (1864).

Tigriopus Lilljeborgii, *Norman*. Last Shetland Dredging Report, p. 296 (1868).

Rostrum short and blunt. Anterior antennæ (fig. 1) robust, second and third joints longer than the fourth, and nearly equal, seventh and eighth joints very short, about half as long as the sixth and ninth, which are nearly equal. Inner branch of the posterior antenna rather large, 3-jointed (fig. 3). Lateral segments of the maxilla (fig. 4) slender. Posterior foot-jaw (fig. 5) forming a broadly ovate or sub-pyriform chelate hand, without an angular promontory, but bearing a strong bristle on the inner margin which is strongly convex,

while the outer margin is only moderately so ; terminal claw stout, sub-falciform. First pair of feet (fig. 6 and 6 a) thick and short ; first joint of the outer branch elongated, ciliated on the external margin, and bearing one short apical seta, second joint scarcely more than half the length of the preceding, truncate at the apex, which is armed with four or five short and strong curved claws, and one long straight bristle, the whole (as remarked by Mr. Norman) bearing a strong resemblance to the foot of a feline animal ; inner branch much shorter, its first joint long, ciliated on the upper half of both margins, the internal edge bearing also near the apex a long ciliated seta ; terminal joints small, 2-clawed. The inner branch of the second foot in the *male* (fig. 7) has the first joint short, broad, and armed at the outer angle with a long plumose hair, second joint produced at each apical angle into a long and strong spine, the outer one being strongly ciliated ; third joint slender, shorter than the spinous processes of the preceding joint, and furnished with four apical setæ, one of which is very long. The spines of the third foot in the male are not unduly developed. The outer and inner segments of the fifth pair of feet are of nearly equal length and breadth in the *female* (fig. 9), and each bears five marginal setæ of moderate length ; in the *male* the inner segment is reduced to a single seta (fig. 10), the outer one being fairly developed, quadrate, and bearing four marginal setæ. Margins of abdominal segments not denticulated, but spinous at the angles. The last segment of the abdomen is cleft, the caudal segments

(fig. 11) about as long as broad, and the inner of the two principal tail-setæ is excessively long, being quite equal in length to the whole body of the animal. Length $\frac{1}{3}$ rd of an inch (1.1 mm.).

Considerable interest attaches to this species on account of its wide geographical distribution. It is restricted almost exclusively to the uppermost margin of the littoral zone, haunting more especially shallow pools at or above high-water-mark, and often occurring in prodigious numbers towards the end of summer when the water has become warm with prolonged exposure to the sun. In such situations it occurs almost everywhere round the British Islands, and has been found by Continental naturalists in various places on the coasts of the Baltic and North Seas. I have also had specimens sent to me from Kerguelen Island in the southern hemisphere, where it was found by Mr. Eaton of the "Transit of Venus Expedition." Some specimens which are indistinguishable from *H. fulvus* were dredged by Mr. Robertson and myself in a depth of thirty-five fathoms off the Yorkshire coast, and were noted by us in the British Association Report for 1875, as a new species under the name *H. crassicornis*. This name must, however, now be withdrawn, as, notwithstanding the unusual nature of the habitat, there seems nothing to separate these specimens from the species now under consideration. In one fresh-water locality (Kinny Lough, County Donegal) we have found this species; but there is little reason for surprise here, the Lough being in close proximity to the sea, almost on the sea-

level, and very possibly, during storms or excessively high tides, exposed to some admixture of salt water.

3. HARPACTIONUS FLEXUS, *Brady and Robertson*. Pl. LXIV, figs. 12—18.

Harpacticus flexus, B. & R. Ann. and Mag. Nat. Hist., ser. 4, vol. xii, p. 134, pl. ix, figs. 17—21 (1873).

First pair of antennæ (fig. 12) rather short, 8-jointed: first four joints in the *female* of nearly equal length, last four also subequal, but less than one-half the length of the preceding; in the *male* (fig. 13) the second joint is very short, the fifth and sixth coalescent and forming a vesiculiform swelling, the last two joints claw-like. Inner branch of the second antenna minute, 2-jointed. Second foot-jaw small, hand elongated, oval, with a slender curved terminal claw. First pair of feet (fig. 15) not materially different from those of *H. chelifer*, but more slender. Outer branch of second foot in the *male* (fig. 16) very similar to that of *H. chelifer*; third foot strongly spined. Body constricted at the base of the abdomen. Fifth pair of feet in the *female* (fig. 17) as in *H. chelifer*; in the *male* (fig. 18) the marginal setæ are shorter and spine-like. Length $\frac{1}{40}$ th of an inch (.64 mm.).

Taken by the surface-net in Westport Bay, Ireland. Dredged in depths of ten to twenty fathoms amongst the Scilly Islands, off Bute, and in one or two fathoms at Kames Bay, Cumbræ (Firth of Clyde), and in Lough Swilly (Donegal).

The form of the lower foot-jaw and the 8-jointed anterior antenna separate this species distinctly from *H. chelifera*. In other respects the two are closely similar, *H. flexus* being, however, much more sparingly provided with spines and cilia. This general resemblance may lead to the suspicion that the one is perhaps only an immature form of the other, and but for the totally different form of the lower foot-jaw, one might very readily be led to adopt that view. In some of the localities mentioned above, the species occurred in tolerable abundance.

Genus 29. ZAUS, Goodsir (1845).

Body broad and depressed; head distinct from cephalothorax; rostrum broad and truncate. Anterior antennæ 9-jointed; posterior 2-jointed, inner branch slender, 2-jointed. Mandibles small, palp slender, 2-branched. First pair of feet 2-branched; outer branch indistinctly 3-jointed, the median joint very short; inner branch 2-jointed, short, last joint rudimentary; ovisac large, adpressed, single. In other respects like *Harpacticus*.

1. *ZAUS SPINATUS, Goodsir. Pl. LXVI, figs. 1—9.*

Zaus spinatus, Goodsir. "On several new species of Crustaceans allied to Saphirina;" *Ann. and Mag. Nat. Hist.*, vol. xvi, p. 326, pl. xi, figs. 1—8 (1845).

- Zaus spinosus*, Claus. Die frei-lebenden Copepoden, p. 146,
taf. xxii, fig. 25; taf. xxiii, figs. 1—10 (1863).
— — Boeck. Oversigt Norges Copepoder, p. 40 (1864).

Cephalothorax much expanded, the posterior lateral angles of the various segments produced and overlapping; abdomen considerably narrowed and constricted at the base; margins of the first body-segment beset with a few short rigid projecting setæ; integument simple, not pitted nor perforated. Anterior antennæ slender, shorter than first body-segment, 9-jointed; first joint short, third much the longest, second and fourth shorter and nearly equal; last five joints minute; the whole limb clothed with rather short setæ: posterior antennæ (fig. 3) 2-jointed, the first joint bearing a small 2-jointed inner branch; the second terminating in four geniculated setæ and three spines, each of which bears a brush-like appendage composed of radiating tactile (?) filaments (fig. 4). Mandibles (fig. 5) small; palp composed of a basal joint and two small setiferous branches. Maxillæ and first pair of foot-jaws small. Second pair of foot-jaws (fig. 7) small, the hand quadrate and bearing two small and thick, crooked claws. First pair of feet (fig. 8) 2-branched, inner branch short, terminal joint very small and bearing one or two claws, one of which is minute; outer branch 3-jointed, the median joint small and indistinctly separate; last joint dilated at the apex, and bearing four slender falciform claws, the inner margins of which are beset with comb-like rows of minute setæ. The three following pairs of feet are 2-branched, each branch being 3-jointed, the terminal joint of each

outer branch bearing on its external margin, near the apex, three marked spines (fig. 8), each of which is bordered externally with a closely appressed series of radiating filaments, each group having much the appearance of a minute hair-brush. Outer branch of the fifth pair of feet in the *female* (fig. 9) elongated, quadrate, bearing five terminal setæ, and closely ciliated on the outer margin; inner branch short and broad, densely ciliated, and bearing two long and two or three short hairs: in the *male*, the inner segment is obsolete, the outer not much different from that of the female. Caudal segments short and broad; inner tail-setæ stout, about as long as the abdomen, outer scarcely half as long. Colour pale yellowish, the central body-segments sometimes tinged with lilac or blue. Length $\frac{1}{48}$ th of an inch (.52 mm.).

This species does not seem to be of very frequent occurrence, but is perhaps commoner on the east coast than elsewhere. It was first found by Mr. Goodsir in the Firth of Forth, and I have taken it in several places on the coasts of Durham and Northumberland, usually amongst *Laminaria saccharina* or other Fuci. Dredged in 10—12 fathoms amongst the Scilly Islands, and in Ventry Bay on seaweeds. Mr. Norman has found it amongst weeds in Balta Sound, Shetland, and between tide-marks at Ohan.

2. ZAUS GOODSIRI, *Brady*. Pl. LXVI, fig. 10—13.

Zaus ovalis, Claus. Die frei-lebenden Copepoden, p. 146, tab. xxii, fig. 18, and tab. xxiii, figs. 11—18 (1863).

Body elongated, depressed, sub-pyriform, first segment about one third the length of the animal; rostrum large, much broader than long, slightly rounded in front; abdomen narrower than the cephalothorax. Anterior antennæ slender and tapering, 9-jointed; first, second, and third joints longest and sub-equal, fourth and sixth much shorter and nearly equal, the rest minute; the *male* anterior antenna (fig. 11) is stouter, less tapered, and more profusely setose at the apex, the fifth and sixth joints small and constricted, the seventh somewhat swollen, but not vesiculated. Posterior antennæ and mouth-organs not materially different from those of *Z. spinatus*. Swimming feet also like those of *Z. spinatus*, except that the terminal claws of the inner branch of the first pair are much more slender and longer (fig. 12). Outer segment of the fifth pair of feet in the *female* (fig. 13) elongated, subovate, margins hispid, apex bearing five plumose setæ; inner segment almost obsolete, bearing four setæ, one of which is long and plumose; in the *male*, the inner portion is entirely wanting. The abdomen gradually tapers backwards, and the posterior angles of its first two segments, as well as all those of the cephalothorax, are much produced and acutely

angular; caudal segments large, about twice as long as broad; length of the principal tail-setæ about equal to that of the abdomen. Colour deep yellowish-brown. The integument is marked with closely-set subcircular foramina or pits, especially towards the front of the body. Length of the animal $\frac{1}{17}$ th of an inch (1.5 mm.), greatest width $\frac{1}{3}$ rd of an inch.

The following are the localities from which I have notes of the capture of this species: Portincross (Ayrshire), dredged in fifteen fathoms; off Staiths, Red Cliff, and Robin Hood's Bay (Yorkshire), thirty-five fathoms; Bridlington Bay, one specimen taken in the surface-net. These localities, it will be seen, are all except one on the Yorkshire coast; and in each case the number of specimens found was very small, so that *Z. Goodsiri* must be looked upon as one of the rarest, as it is certainly one of the finest, of British Harpacticidæ.

Dr. Claus has identified this species with *Goodsir's Sterope ovalis*, and considers *Sterope armatus* of that author to be simply the male of the same animal. I am unable, however, to agree with this view. *Goodsir's* figures, if meant to represent this species, are certainly very unfortunate, showing in both cases an abruptly-rounded abdomen, without any distinct caudal segments. Moreover, in *S. ovalis* the anterior segment of the body is stated to be as long as the entire length of the remaining segment, and the posterior legs to be armed on the lateral edges with strong spines, of which the two terminal are the longest. Both these characters are certainly incorrect as applied to the present species.

It is, indeed, difficult to say with any degree of certainty what species Goodsir had in view, his written and engraved descriptions being altogether inadequate. On this account I venture to propose a new specific name, *Goodsiri*, for the form here referred to.

Genus 30. PELTIDIUM, *Philippi* (1839).

(*Alteutha*, Baird, 1845. *Carillus*, Goodsir; *Sterope*, Goodsir (in part), 1845.)

Body depressed, incised between the segments, ovate or subovate, abdomen not distinctly separate from the cephalothorax; integument very strong and thick; caudal segments and setæ short. Anterior antennæ shorter than the first body-segment, 9-jointed, slender and tapered in the *female*, in the *male* knotted and clawed at the apex; posterior antennæ 4-jointed, a small 2-jointed secondary branch attached to the apex of the second joint. Mandibles minute, basal joint of the palp expanded distally, and bearing two 1-jointed branches, the innermost of which is the longest; each branch as well as the base bears three setæ, and the longer branch has also a small lateral uni-setiferous digit. Maxillæ very small; palp much larger than the masticatory portion, composed of a basal joint and three setiferous segments, the middle being the largest, clawed at the apex, and provided with a short lateral setiferous process. First pair of foot-jaws laterally

digitate, clawed at the apex (not unlike those of *Thales-tris*), second pair elongated, 3-jointed, terminating in a strong clawed hand. All the swimming feet have both branches elongated and 3-jointed, but the first pair has the outer branch very long and angularly flexed, the last joint very short, and terminating in two or three prehensile claws. Fifth pair simple, stout, 2-jointed, the second joint much elongated, and strongly spinous on the outer margin and apex.

Goodsir's figure of the first foot of *Carillus oblongus* is so characteristic that there can be no doubt of the identity of that species with some member of the present genus, while his representation of the second foot-jaw ("second thoracic leg") would lead me to suppose that the species in view must have been *Alteutha depressa*, Baird. As regards *Sterope interrupta* of the same author—the figures and description of the posterior pair of feet also point to the genus *Alteutha*, and the general form of the animal to *A. bopyroides*, Claus. Though there must, for the present, be some doubt as to the species referred to by Philippi (Weigmann's Archiv., 1839), there can be none, I think, as to the genus, which by the structure of the limbs and mouth-organs, most of which are clearly figured by Philippi, is distinctly shown to be identical with *Alteutha* and *Carillus*. The name *Peltidium* being older by six years than those of Baird and Goodsir, must therefore be adopted as the generic appellation.

Though, in general outline and in the depressed form of the animal, these species exhibit an approach to the previous group—*Zaus*, *Scutellidium*, and *Porcel-*

lidium—they differ very remarkably in the structure of the mouth-organs and the first pair of swimming-feet, as well as in the minor characters of other parts. Altogether, indeed, these organs are much nearer in structure to those of the typical *Harpacticidæ* than are those of the immediately preceding genera.

1. PELTIDIUM DEPRESSUM (*Baird*). Pl. LXXII, figs. 1—5.

Alteutha depressa, Baird. Trans. Berwick Nat. Club, ii, p. 155 (1845); Nat. Hist. Brit. Entom., p. 216, tab. xxx, figs. 1, 2 (1850).

Carillus oblongus, Goodsir. Ann. and Mag. Nat. Hist., vol. xvi, pl. xi, fig. 12 (1845).

Peltidium purpureum, White. Popular History of British Crustacea, p. 308, pl. xviii, fig. 4 (1857).

— — ? Philippi. Weigmann's Archiv, p. 131, taf. iv, figs. 12, 13 (1839).

Alteutha purpurocincta, Norman. Brit. Assoc. Report, p. 298 (1868).

Body ovate; first segment nearly one half the length of the body; rostrum large, broad, and prominent; second joint of the anterior antenna (in the *female*) longest; first, third, and fourth nearly equal to each other, and about two thirds the length of the second; last five joints very small, all rather densely setose (fig. 2). Second foot-jaw (fig. 3) 3-jointed; hand ovate, shortly setose on the inner margin. Fifth foot not spinous on the sides, but armed at the truncate apex with three strong spines, the innermost of which is the longest (fig. 4). Caudal lamellæ nearly twice as long as broad, not tapered to the apex, bearing four terminal spines, the innermost the longest, the outer-

setæ short and stout. Eyes large and of a bright ruby red, situated considerably behind the origin of the first pair of antennæ. Integument dense and tough; colour yellowish olive, except the second and third segments, which are of a deep bluish purple, the fourth and fifth segments also more lightly stained with the same colour. Length $\frac{1}{15}$ th of an inch (1.33 mm.).

This beautiful species haunts chiefly the fronds of *Laminariæ*, and will probably be found wherever *L. saccharina* grows. Mr. Norman notes it as being abundant at Hillswick, Shetland; Mr. Spence Bate has found it at Plymouth, and Dr. Baird in Berwick Bay. I have found it at Sunderland and Cullercoats, and in Clifden Bay, Ireland. It does not often occur amongst dredged material, but I noticed it on one occasion amongst coarse sand from a depth of four fathoms at Sunderland.

It is possible that Philippi's figure may be intended to apply to this species, but if so it is unfortunate, and must have been taken from a specimen distorted by pressure. At any rate there can be no doubt that, though the figures are poor, Dr. Baird's description of *Alteutha depressa* is applicable to this and to no other British species.* I have therefore adopted his specific name, regretting the necessity of discarding the more characteristic ones of Philippi and Norman.

* Specimens wholly without colour are sometimes met with, and I do not doubt that it was from such a one that Dr. Baird drew his figures and descriptions. In any other case it would have been impossible for him to omit noting the very striking coloration of the animal.

2. PELTIDIUM INTERRUPTUM (*Goodsir*). Pl. LXXI, figs.
4—15.

Sterope interrupta, Goodsir. Ann. and Mag. Nat. Hist., vol. xvi,
pl. xi, fig. 10 (1845).

Alteutha bopyroides, Claus. Die frei-lebenden Copepoden, p. 143,
taf. xxii, figs. 10—17 (1863).

— *norvegica*, Boeck. Oversigt Norges Copepoder, p. 48
(1864).

Body elongated, ovate, deeply incised at the junctions of the thoracic segments. Second joint of the female anterior antenna somewhat swollen, otherwise the organ in both sexes is nearly like that of the preceding species (figs. 4, 5). Second joint of the posterior foot-jaw (fig. 11) very short, the hand ovate and ciliated on the inner margin. Fifth pair of feet (fig. 14) extending beyond the middle of the abdomen, sword-shaped, strongly spinous; three stout blunt spines—the middle one the largest—at the apex, and two on the external margin; one slender marginal seta near the middle. Caudal segments short and broad, armed with four setæ, three of which are about as long as the segment itself, and one about twice as long. Integument (fig. 15) thick, porous, very opaque, variously coloured with dark yellowish or reddish brown; the caudal segments and the antennæ pale. Length $\frac{1}{2}$ and of an inch (1.1 mm.).

This is a very common oceanic species all round our shores, but is only rarely met with between tide-marks. The female is at least as common as the male, although Dr. Claus had not met with a specimen

at the time of writing his work on the Copepoda. The only females, with ova, which I have seen were dredged in a depth of ten fathoms off the Durham coast.

Dr. Claus's description of the lower foot-jaw ("styli basali elongato non articulato") is scarcely correct, there being a very small joint intercalated just behind the hand.

3. PELTIDIUM ORENULATUM, *nov. sp.* Pl. LXXII, figs. 6—15.

Body subovate, broader in front than behind, incised at the junctions of the thoracic segments. Anterior antennæ slender; first two joints longest, third and fourth about half as long; next four very short; last about as long as the seventh and eighth together. Peduncle of the posterior foot-jaw (fig. 9) composed of two equal joints; hand subquadrate and marginally ciliated. The fifth foot in the *female* (fig. 10) has three rather sharp and slender apical spines (one long and two short), together with two smaller spines on the inner edge near the apex; that of the *male* (fig. 11) has one large curved apical and four much smaller marginal spines, all of them very blunt; the first abdominal segment has also a strong spine at the outer angle (fig. 11 *a*); the inner angle of the peduncle is produced and orenulated (fig. 10 *a*). The produced angles of the abdominal segments in

the *male* are crenulated; so also is the anal operculum (fig. 14 *a*), the lower border of the last abdominal segments (*b*), and of the thoracic segments (fig. 12). Caudal segments broader than long, bearing three principal setæ, the innermost of which is stout, and about half the length of the abdomen, the outer very much shorter. Integument thick and closely perforated (fig. 15). Colour yellow, the hinder portion of the first segment, and the abdomen, tinged with brown or orange, the last thoracic and margins of first abdominal segment with bluish purple. Length $\frac{1}{8}$ th of an inch (1 mm.).

Apparently a very local species. On Algæ near low-water-mark at St. Mary's and St. Agnes (Scilly Islands), where it was also taken in the surface-net in the evening. A few specimens only amongst roots of Algæ between tide-marks at Roundstone, Connemara.

Sub-family 8. PORCELLIDIINÆ, Boeck.

Body much depressed; secondary branch of posterior antenna 1-jointed; mandible-palp forming a large setiferous lamina. Anterior foot-jaw not clawed, posterior forming a prehensile hand. Inner branch of first foot broad, 1-jointed; fifth pair forming broad laminar expansions; caudal segments broad and laminated.

The genus *Porcellidium* is the only representative of this sub-family.

*Genus 31. PORCELLIDIUM, Claus (1860).**(Thyone, Philippi.)*

Body oval, depressed, in the *female* 6-, in the *male* 7-jointed. Anterior antenna 6-jointed, in the *male* obtuse, knotted, and adapted for clasping; posterior 4-jointed, secondary branch of moderate size, 1-jointed, attached to apex of second joint. Mandible-palp large, forming an irregularly shaped, oblong lamina, beset with numerous stout ciliated filaments. Maxilla composed of a toothed masticatory branch, with a complex, 4-digitate palp. Anterior foot-jaw not forming a prehensile hand, divided at the apex into short digits, which bear slender, terminal, claw-like setæ; posterior foot-jaw 3-jointed, elongated, simple, with two small, crooked, apical claws, and a laminar appendage. Outer branch of first pair of feet short, 3-jointed; inner branch composed of one excessively broad triangular joint, which is clawed at the apex, claws bearing delicate laminar expansions. Second, third, and fourth pairs with both branches 3-jointed, branches subequal, except in the second pair, which has the outer branch very short; fifth pair laminar, subtriangular; caudal segments lamellar.

1. PORCELLIDIUM TENUICAUDA, *Claus.* Pl. LXIX, figs. 10
—13; Pl. LXX, fig. 5.

Porcellidium tenuicauda, Claus. Beiträge zur Kenntniss der
Entomostraken, 1 Heft, p. 6,
taf. 2, figs. 10—18 (1860).
— — — Die frei-lebenden Copepoden,
p. 140 (1863).

First segment not quite half the length of the body; caudal segments acutely pointed behind, the two together forming a heart-shaped lamina. Anterior antenna 6-jointed; last two joints very short. Outer branch of the second foot only as long as the first joint of the inner branch. Fifth pair of feet large, triangular, reaching as far as the extremity of the abdomen, very wide at the base, acutely pointed behind, divided longitudinally by a rib-like, curved line; margins finely ciliated; a single short seta near the middle of the outer margin. Integument thick and marked with thickly-set small circular impressions. Colour yellowish, the central portion of the body often tinged with deep crimson. Length $\frac{1}{3}$ rd of an inch (1.1 mm.).

Of rare occurrence. I have not seen more than half a dozen specimens, most of which were found amongst *Laminariæ* in the west of Ireland:—Birtirbuy, Clifden, and Ventry Bays. One specimen dredged off St. Agnes (Scilly), in a depth of ten fathoms.

2. PORCELLIDIUM FIMBRIATUM, *Claus.* Pl. LXX, figs. 1—4.

Porcellidium fimbriatum, Claus. Die frei-lebenden Copepoden, p. 140, t. xxii, fig. 1 (1863).

Body scarcely at all attenuated behind, broadly oval, width equal to two thirds of the length; integument pitted, as in the preceding species. Mouth-organs and swimming-feet scarcely different from those of the previous species. Fifth pair of feet (fig. 1 *a*) forming two broadly triangular plates, with finely ciliated margins, between which the caudal segments are intercalated; last thoracic segments (fig. 1 *b*) produced backwards into long triangular laminae, which reach as far as the apices of the fifth feet. Caudal segments (*c*) elongated, broad, laminar, with broad, finely ciliated extremities. Colour yellowish or pale olive, often tinted with red and violet. Length $\frac{1}{35}$ th of an inch (1 mm.).

P. fimbriatum, like the rest of the genus, occurs chiefly on the fronds of *Laminariæ* and other seaweeds; it is also sometimes taken by the dredge in considerable numbers, in localities where decomposing Algæ and other vegetable matters are deposited. Clifden, Birtirbuy and Ventry Bays (Ireland); Cumbrae and Portincross (Firth of Clyde); St. Mary's (Scilly); Alnmouth (Northumberland); Oban, Hillswick, and Lerwick (*Rev. A. M. Norman*).

3. PORCELLIDIUM VIRIDE (*Philippi*). Pl. LXX, figs. 6—8.

Thyone viridis, Philippi. Weigmann's Archiv, p. 190, taf. 4, fig. 2 (1840).

Porcellidium dentatum, Claus. Beiträge zur Kenntniss der Entomostraken, p. 8, pl. ii, figs. 19—22 (1860).

— — — Die frei-lebenden Copep., p. 140 (1863).

Body very broadly oval, width equal to three fourths of the length, not at all attenuated behind, more or less truncated in front, especially in the *male*; integument only slightly pitted. Anterior antennæ 4-jointed, with coalescent second, third, and fourth joints. Last thoracic segment proportionately much broader and less elongated than in the two preceding species; fifth pair of feet (fig. 8 *a a*) quadrate, dilated at the extremity, and fringed with about six small sharp spines; caudal laminæ (*b b*) also quadrate, with obtuse, broad extremities, which bear four small setæ at the outer and two at the inner angles. In the *male* these plates project somewhat beyond the apices of the fifth feet. Colour greenish yellow. Length $\frac{1}{40}$ th of an inch (.63 mm.).

Found in the same situations as the preceding, and equally, if not more, abundant. The list of localities given for *P. fimbriatum* applies accurately to the present species.

There seems little reason to doubt the identity of this species with Philippi's *Thyone viridis*; the serration of the lower border of the fifth foot is very distinctly marked in that author's figure, and I do not know any

other form to which that character would apply. The generic term *Thyone*, however, having been previously in use to designate a genus of Echinodermata, must give place to the name proposed by Claus.

4. PORCELLIDIUM SUBBOTUNDUM, *Norman*. Pl. LXXI,
figs. 1—3.

Porcellidium subrotundum, *Norman*. Brit. Assoc. Report, p. 297
(1868).

Body short, subcircular, nearly as broad as long, subtruncate in front, broadly rounded behind; anterior antennæ 6-jointed, short, not reaching the sides of the cephalothorax. Last thoracic segment (fig. 3 *a*) lacinated at the angles; fifth pair of feet (*b*) triangular, with a few spine-like setæ on the distal margin; caudal lamellæ broad and square; three setæ on the outer and one on the inner distal angle. Colour pale yellowish green, more or less tinged with pale purple or violet; integument not pitted. Length $\frac{1}{3}$ rd of an inch (.77 mm.).

Not so common as either of the two foregoing species, but occurring in similar positions. Hillswick, Shetland (*Rev. A. M. Norman*); Clifden and Birtirbuy Bays, and Portincross (Firth of Clyde).

I retain this species more out of deference to Mr. Norman's practised judgment in the matter of specific distinctions, than from any conviction of my own as to its validity. Indeed I am very much disposed to suspect that it may be found to be a form of the

female *P. viride*, the very poorly developed or almost obsolete fourth body-segment being probably a mark of immaturity. It must be admitted, however, that the size of the animal—fully equal to that of *P. viride*—is an argument against this view. But I have seen no male referable to *P. subrotundum*, and the caudal laminae, as well as the antennae, are almost identical with those of the female *viride*.

Sub-family 9. IDYINÆ, nov. sub-fam.

Cephalothorax more or less depressed. Anterior antennae 7—9-jointed; inner branch of the posterior pair 1—4-jointed. Mandible-palp well developed, 2-branched, or provided with complex setiferous plates. Both pairs of foot-jaws forming elongated clawed hands. Inner branch of first pair of feet 2-, outer 3-jointed; three following pairs having both branches 3-jointed; fifth pair elongated, 2-jointed. One ovisac.

This group includes only *Idya* and *Scutellidium*, which are very like each other in habit and general appearance. The structure of the mandible-palp is, however, widely different in the two genera, and might probably be safely used as the basis of separation into two sub-families.

Genus 32. IDYA, Philippi (1843).

(Tisbe, Lilljeborg, Claus.)

Cephalothorax broad and somewhat depressed; abdomen narrow, 5-jointed. Head coalescent with the first thoracic segment. Anterior antenna 7- or 8-jointed, elongated; inferior 3-jointed, with a large 4-jointed secondary branch. Mandible long and strongly toothed; palp 2-branched, basal joint short, branches 1-jointed, long and slender, setiferous at the apices. Maxilla armed with several slender terminal teeth; palp well developed. First and second foot-jaws nearly alike, uncinatè; first pair 2-, second 3-jointed. Inner branch of the first pair of feet 2-jointed, clawed; outer branch short, 3-jointed; the three following pairs having both branches 3-jointed. Fifth pair elongated, 2-jointed.

In the tendency to flattening and lateral expansion of the cephalothorax, and the uncinatè form of the first foot-jaws, as well as in the dilatation and peculiar armature of the first pair of feet and the elongated fifth foot, this genus exhibits a distinct departure from most of the Harpacticidæ which have been described in the foregoing pages. These characters are even more marked in the next succeeding genus, *Scutellidium*. The genus *Harpacticus*, in the structure of the first pair of feet, and *Zaus*, both in that character and in the lateral expansion of the body,

at any rate in the littoral and laminarian zones, occurring usually in considerable numbers, though never in the countless swarms of some of the larger oceanic species. It is occasionally found amongst dredged material, but possibly this may, in some cases at least, arise from its being entangled during the upward passage of the dredge through the water; in the open sea it is often taken by the tow-net. Dr. Claus has taken it both in the North Sea and in the Mediterranean, M. Boeck on the coast of Norway, and Fischer in Madeira (P). With so wide a range of distribution we need not wonder that its range of variation is likewise great, and Dr. Claus has pointed out (*loc. cit.*) some of the characters, especially the lengths of the antennal joints, which are thus liable to vary; I have no doubt that a minute examination would show great diversity of structure—perhaps even some well-marked races or varieties—in the species as it exists on our own shores. At one time, indeed, I was disposed to think that two or more species had been grouped under one name, but further examination showed this idea to be untenable, and without more time than I had at my disposal it would have been impossible to attempt satisfactorily any unravelling of the complicated problems connected with race variation.

*Genus 33. SCUTELLIDIUM, Claus (1866).**(Porcellidium, Boeck, 1864. Aspidiscus, Norman, 1868.)*

Body depressed, subovate. Anterior antennæ 9-jointed, with very short median joints; posterior 3-jointed, the inner branch short, 1-jointed (?). Mandible-palp (Pl. LXVIII, fig. 4) large and complex, bearing numerous stout setiferous filaments; maxillary palp (fig. 5) provided with two very long and stout ciliated setæ. Both pairs of foot-jaws forming clawed hands. First pair of feet prehensile, very like those of *Idya*. Fifth pair foliaceous, the outer branch much elongated. One ovisac.

1. SCUTELLIDIUM TISBOIDES, *Claus*. Pl. LXVIII, figs.
1—10

Scutellidium tisboides, Claus. Die Copepoden-fauna von Nizza, p. 21, taf. iv, figs. 8—15 (1866).

Cephalothorax broad, rounded in front; second, third, and fourth segments very short; abdomen much narrowed. Anterior antennæ 9-jointed, the first three joints large (fig. 2), fourth and eighth very short, fifth, sixth, and seventh shorter still, terminal joint longer and slender; the fourth, fifth, and sixth joints are each successively narrower than the preceding, the last three being slender and of nearly equal width. Foot-jaws short and stout; last joint of the first pair (fig. 6) slender and bearing two curved apical

claws; hand of the second pair (fig. 7) dilated at the base, subpyriform, terminating in three strong claws. Both branches of the first pair of feet (fig. 8) are 3-jointed and thick, the last joint being in both cases extremely small, and the terminal claws expanded into delicate pulvilliform appendages; the first joint of the inner branch is much dilated towards the base; the external margin is ciliated, the internal ciliated near the base, and gives origin, near the middle, to a large plumose seta; the second joint has a single short seta; first joint of the outer branch ciliated externally, and provided with a large plumose apical seta; second and third joints each with one plumose apical seta; the outer branch is much the shorter of the two. Three following pairs of feet 2-branched, each branch composed of three joints; the second pair much shorter, however, than the third and fourth, destitute of marginal spines, and having the inner branch shorter than the outer; first joint of the outer branch fringed externally with a number of spine-like setæ; the external margins of all the joints in the third and fourth pairs (fig. 9) are beset with short, stout spines, those of the first joints more slender than the rest, the limb being very similar to that of the Calanidæ. The fifth pair is 2-jointed (fig. 10), the basal joint marginally ciliated, elongated, and cleft at the apex, each segment bearing a single long seta; second joint much elongated, narrow, marginally ciliated, with irregular transverse rows of hairs towards the internal margin, one long seta on the external margin, and three at the apex. The last

cephalothoracic segment (fig. 1) in the *female* is extremely small; the first abdominal segment is formed by the almost complete union of two segments, the point of junction being marked by a chitinous line on each side; the remaining abdominal segments, as well as those of the tail, are very short and broad. The inner tail-setæ are considerably longer than the abdomen. Eye consisting of one central and two lateral lenses. Ovisac large, circular, and extending considerably beyond the extremity of the tail. Length $\frac{1}{2}$ th of an inch (.98 mm.).

Excepting one imperfect specimen, which had four deep red bands across the body, I have not seen the male of this species, but Dr. Claus figures it, describing the anterior antennæ as being modified for clasping, and the fifth pair of feet diminished in size, as is usual. Dr. Claus asserts the secondary branch of the posterior antenna to be 4-jointed, but after repeated examination, I have failed to satisfy myself of the exact state of the case. In some of my specimens the branch appeared, indeed, to be indistinctly (and perhaps 4-) jointed, but the articulations were so faint that I should have overlooked them altogether without careful search; and even yet I should hesitate to affirm that there is more than a single joint.

S. tisburyi seems to be of rare occurrence. I have taken one or two specimens at Roker, near Sunderland, on fronds of *Laminaria saccharina*, a few on weeds in tide-pools at Clifden and Roundstone, and a rather larger number on weeds in Porcrossa Bay, Scilly.

2. SCUTELLIDIUM FASCIATUM (Boeck). Pl. LXVIII, fig. 11 ; and Pl. LXIX, figs. 1—9.

Aspidiscus fasciatus, Norman. Brit. Association Report, p. 298 (1868).

Porcellidium fasciatum, Boeck. Oversigt Norges Copepoder, p. 56 (1864).

Body ovate, abdomen much narrower than the cephalothorax, head and first thoracic segment coalescent ; segments of the thorax produced backwards in acutely pointed, curved, and imbricated processes. Anterior antennæ 9-jointed, slender, gradually tapered from base to apex ; first, second, and third joints in the *female* increasing progressively in length, remaining joints very short ; in the *male* the limb is somewhat flexuous, and hinged between the fifth and sixth joints (Pl. LXVIII, fig. 11) ; the fourth joint is longest, the second somewhat shorter, the first, third, fifth, and sixth still shorter and subequal, the last three very short. The posterior antenna (Pl. LXIX, fig. 2) has a long, slender, secondary branch springing from the apex of the first joint, dilated somewhat beyond the middle, bearing three strong lateral setæ, and at the apex five, one of which is exceedingly long ; the terminal setæ of the main branch are rather short, geniculated, and minutely hooked or clawed at the apices, and the last joint has two minute file-like or aculeated processes near the extremity. Mandibles and maxillæ very similar to those of the preceding species. Anterior

foot-jaw (fig. 4) slender, 2-jointed, the last joint bearing a long, closely pectinated, apical spine and one seta, which is also pectinate or plumose. Posterior foot-jaw (fig. 5) short and robust, the hand irregularly quadrate, and terminating in a short crooked claw. The first pair of feet lie in close apposition, and, like the following pairs, cross each other near the extremities when at rest; they do not differ materially from the same structures in *S. tisboides*; the last two joints of the inner branch of the first foot are, however, very small, and the last joint of the outer branch (fig. 6) bears on the outer margin five curved spines, and at the apex a strongly curved seta. The second pair, as in *S. tisboides*, is almost spineless, but the third and fourth have marginal spines, and the two distal joints of the outer branches (fig. 7), besides having densely setose margins, have also curved rows of short spine-like hairs scattered over the surface. Fifth pair elongated, 2-jointed (fig. 8), the first joint larger than the second, both having ciliated outer margins; the first also a seta at each distal angle; the second three long and two smaller setæ. In the *male* the fifth foot is somewhat similar (fig. 9), but very much smaller than in the other sex, reaching only to the extremity of the first abdominal ring, while in the *female* (fig. 1) it extends almost to the base of the caudal segments. Last thoracic segment, in both sexes, very small (fig. 9); the first abdominal segment in the *female* very much larger than the following ones; in the *male* (fig. 9) all five segments are distinct and—except the first, which is longer than the rest—nearly of equal width

caudal segments very short; principal tail-setæ nearly equal to the length of the body; outer setæ about half as long. The eye consists of one central and two lateral lenses, and is of a ruby-red colour; the integument is marked by distant circular punctures or impressions, more especially near the edges of the carapace. Ovisac large, circular, and single. The colour of the animal is a clear yellowish brown or olive; there is usually, but not always, a brilliant ruby patch extending nearly across the body behind the first segment, and the glandular organs are less distinctly tinged with the same colour. Length of the female $\frac{1}{3}$ th of an inch (.98 mm.), of the male $\frac{1}{40}$ th of an inch (.64 mm.).

This species occurs often abundantly on the fronds of *Laminariæ*; on the coasts of Northumberland and Durham, wherever *L. saccharina* grows, it may be found plentifully; also in Shetland (*Rev. A. M. Norman*), Ventry Bay (*Rev. E. C. Davison*), Clifden Bay, and the Scilly Islands. No doubt this list might easily be much extended.

The brilliant colouring and considerable size of the species render it a very showy and attractive object, and it is surprising that, as it occurs so commonly on the British shores, it should not yet have been noticed elsewhere in Europe except by M. Boeck, in Norway. In this respect it is a match for *Cythere albomaculata* amongst the Ostracoda, an excessively common British form, which has, as yet, not been recognised on the continent of Europe. Mr. Norman (*loc. cit.*) has proposed a new genus for the reception of this

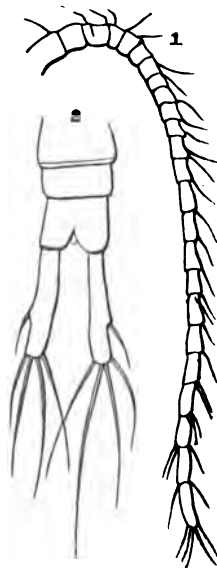
animal, but the structural resemblances between it and the *Scutellidium* of Claus are so striking, and the differences so extremely slight, that I think it best to include both in the same generic group.

APPENDIX.*

CYCLOPINA (?) OVALIS, *Brady*.

Cyclops ovalis, Brady. Nat. Hist. Trans. Northumberland and Durham, vol. 4, p. 429, pl. xviii, figs. 1, 2 (1872).

Anterior antennæ 24-jointed, as long as the cephalothorax, slender, and nearly equal in width throughout, joints about equal in length and breadth at the base, gradually increasing in length towards the apex, the terminal joint being about thrice as long as broad, each joint bearing a single short, delicate hair on the external margin, the twenty-second and twenty-third one on each margin, the last having four or five apical setæ. Caudal segments about four times as long as broad; setæ about as long as the last three abdominal somites.



* See vol. i, p. 94.

Habitat.—One specimen only taken off Sunderland in the surface-net.

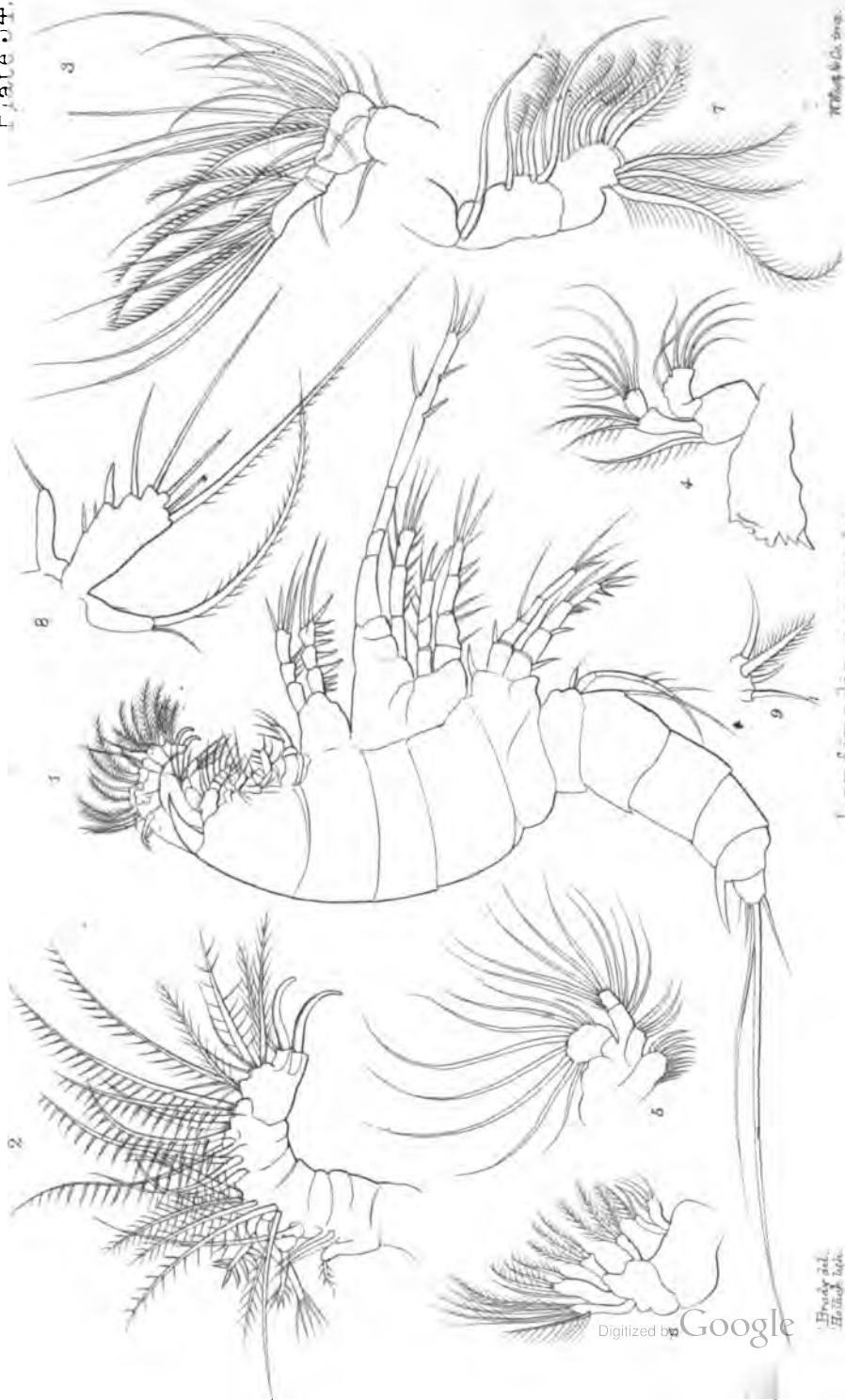
My knowledge of this species is confined to the single specimen from which it was originally described. Seeing, however, that no true marine *Cyclops* is known (the species described as such being insufficiently examined as to structure of mouth-organs, &c.), it seems more probable that *C. ovalis* will be found to belong either to the genus *Cyclopina* or to *Cyclopicera*.

Fig. 1 in the woodcut represents the anterior antenna; fig. 2, the posterior abdominal segments and tail.

PLATE XXXIV.

Longipedia coronata.

- Fig. 1. Male, seen from side.
2. Anterior antenna, male.
3. Anterior antenna, female.
4. Mandible.
5. Maxilla.
6. First foot-jaw.
7. Second foot-jaw.
8. Foot of fifth pair, male.
9. Foot of fifth pair, female.



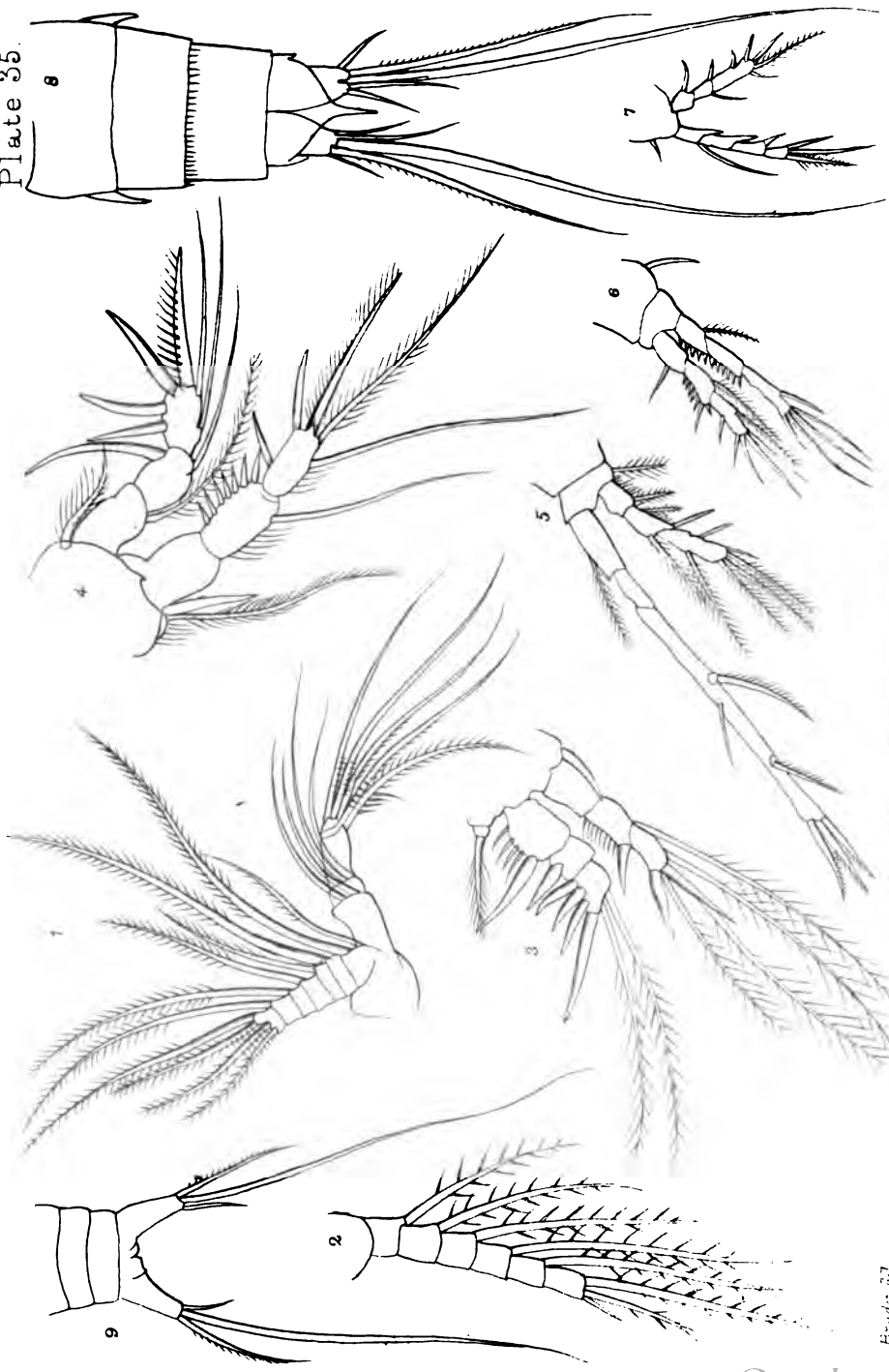
Longipedia coronata

Body ad.
Head loc.

PLATE XXXV.

Longipedia coronata (continued).

- Fig. 1. Posterior antenna, female.
2. Posterior antenna, inner branch of male.
 3. Foot of first pair, female.
 4. Foot of first pair, male.
 5. Foot of second pair, male.
 6. Foot of third pair.
 7. Foot of fourth pair.
 8. Part of abdomen and tail, male.
 9. Part of abdomen and tail, female.



W. H. R. & S. 1909

Leptodica cephalata

Fig. 2-10

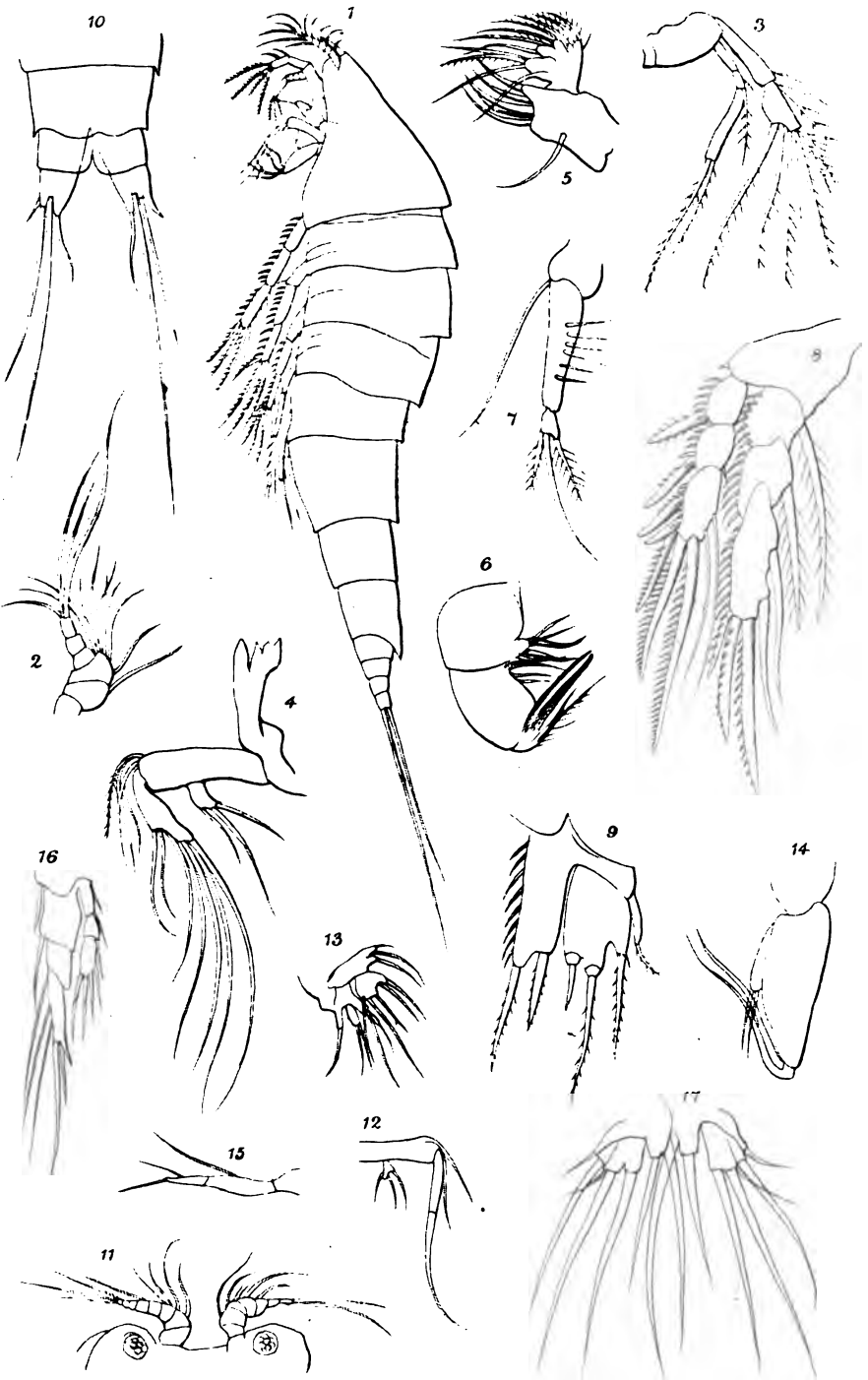
PLATE XXXVI.

Ectinisoma spinipes.

- Fig. 1. Adult seen from side.
2. Anterior antenna.
 3. Posterior antenna.
 4. Mandible.
 5. Maxilla.
 6. First foot-jaw.
 7. Second foot-jaw.
 8. Foot of first pair.
 9. Foot of fifth pair.
 10. Last segments of abdomen, and tail.

Ectinosoma erythropis.

11. Anterior part of head and anterior antennæ.
12. Mandible-palp.
13. Maxilla.
14. First foot-jaw.
15. Second foot-jaw.
16. Foot of first pair.
17. Fifth pair of feet.



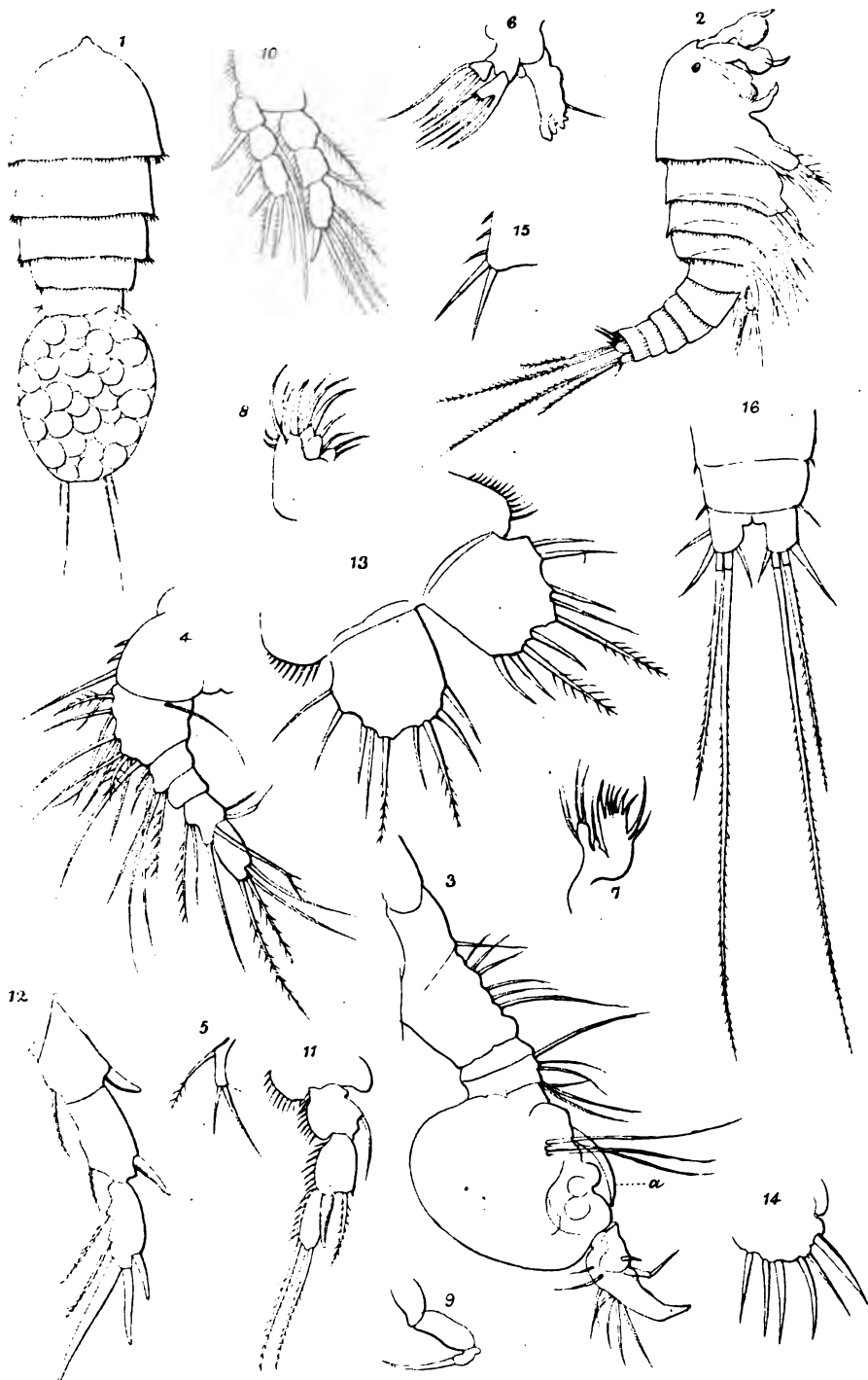
12-17 only 13
14-17 only 14

1-10 Metinosema spinipes
11-17 arthropods

PLATE XXXVII.

Tachidius brevicornis.

- Fig. 1. Adult female.
2. Adult male.
3. Anterior antenna, male.
4. Posterior antenna, female.
5. Inner branch of posterior antenna.
6. Mandible.
7. Maxilla.
8. First foot-jaw.
9. Second foot-jaw.
10. Foot of first pair.
11. Inner branch of second foot, male.
12. Outer branch of third foot, male.
13. Fifth pair of feet, female.
14. Foot of fifth pair, male.
15. Angle of first abdominal segment.
16. Tail.



W. H. Cresson del.
W. H. Cresson sculp.

W. H. Cresson sculp.

Uca *lividicornis* *Stimp.*

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PLATE XXXVIII.

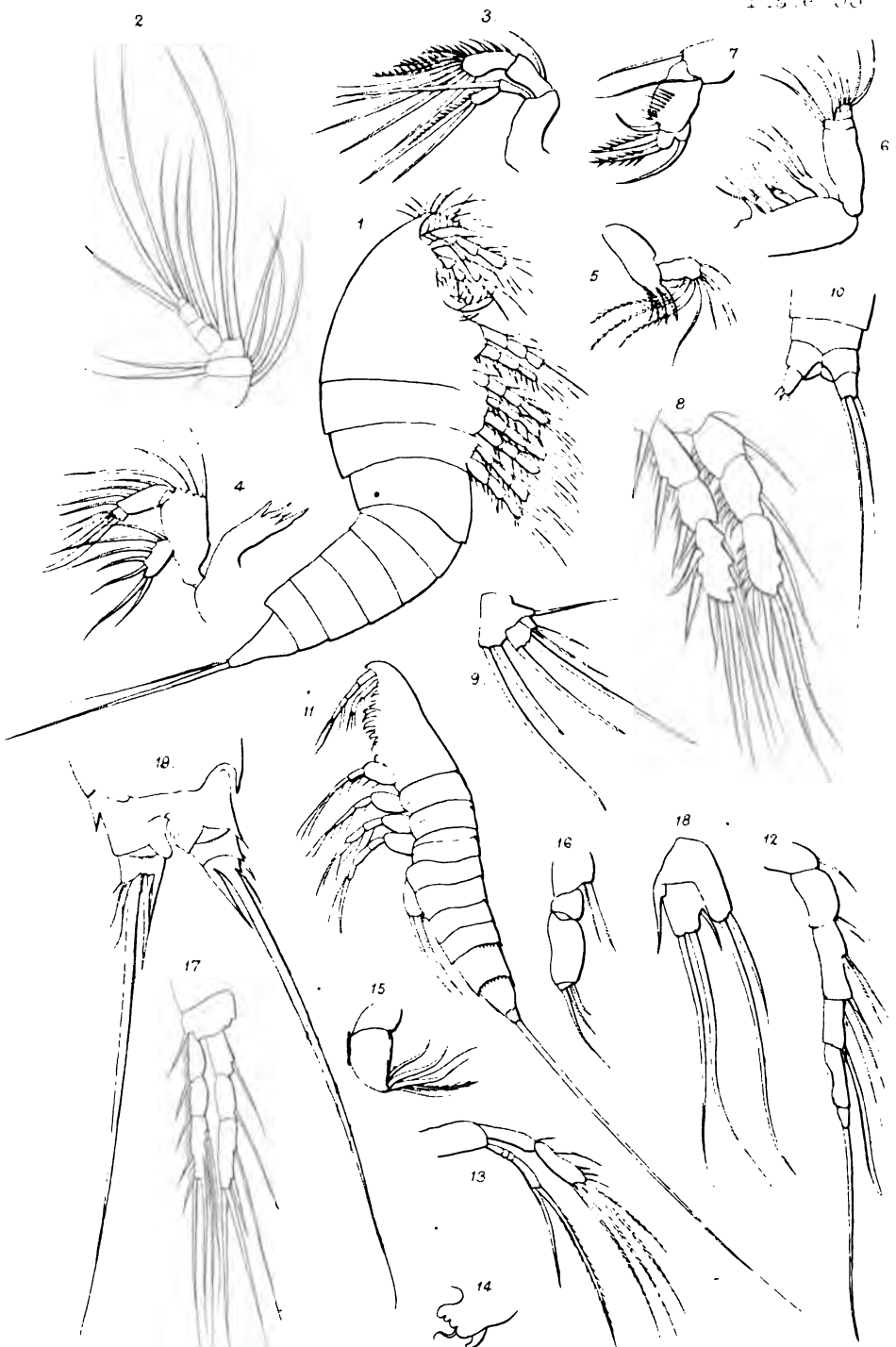
Bradya typica.

- Fig. 1. Adult female.
2. Anterior antenna.
3. Posterior antenna.
4. Mandible.
5. Maxilla.
6. First foot-jaw.
7. Second foot-jaw.
8. First foot.
9. Fifth foot.
10. Tail.

Ectinosoma atlanticum.*

11. Adult (female ?).
12. Anterior antenna.
13. Posterior antenna.
14. Mandible.
15. First foot-jaw.
16. Second foot-jaw.
17. First foot.
18. Fifth foot.
19. Tail.

* On the plate, for *Ectinosoma atlantica*, read *Ectinosoma atlanticum*.



250000

1-10. *Eradya typica*.

11-19. *Ectinosoma atlantica*.

W. H. & C. Co. imp.

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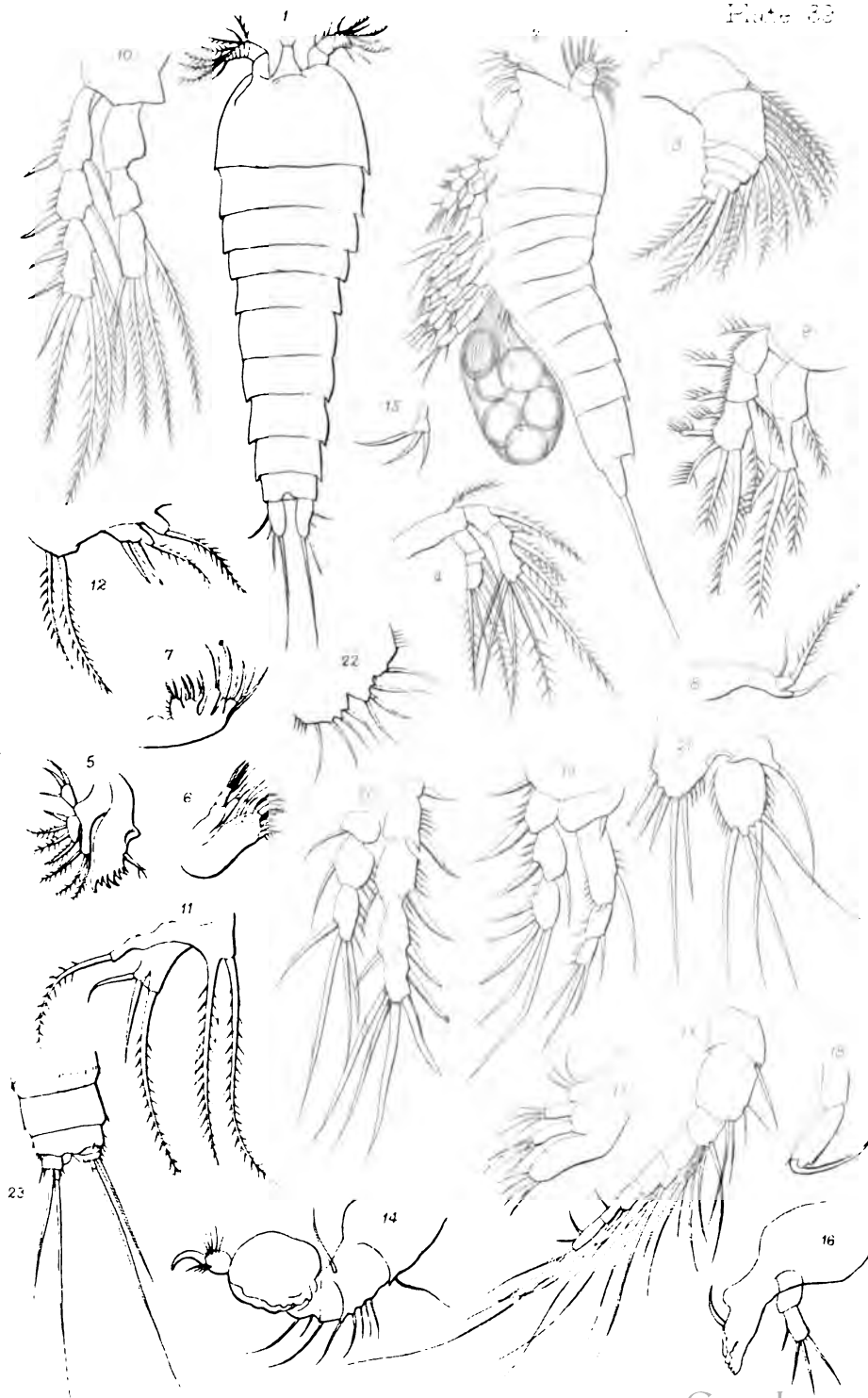
PLATE XXXIX.

Zosime typica.

- Fig. 1. Female seen from above.
2. Female seen from side.
3. Anterior antenna, female.
4. Posterior antenna.
5. Mandible.
6. Maxilla.
7. First foot-jaw.
8. Second foot-jaw.
9. First foot.
10. Second foot.
11. Fifth foot, female.
12. Fifth foot, male.

Canthocamptus palustris.

13. Anterior antenna, female.
14. Anterior antenna, male.
15. Inner branch, posterior antenna.
16. Mandible.
17. First foot-jaw.
18. Second foot-jaw.
19. First foot.
20. Fourth foot.
21. Fifth foot, female.
22. Fifth foot, male.
23. Tail.



63 Br. & G.
47 H. & G. ad.

1 - 12. *Zosime typica*
13 - 23. *Canthocamptus palustris*.

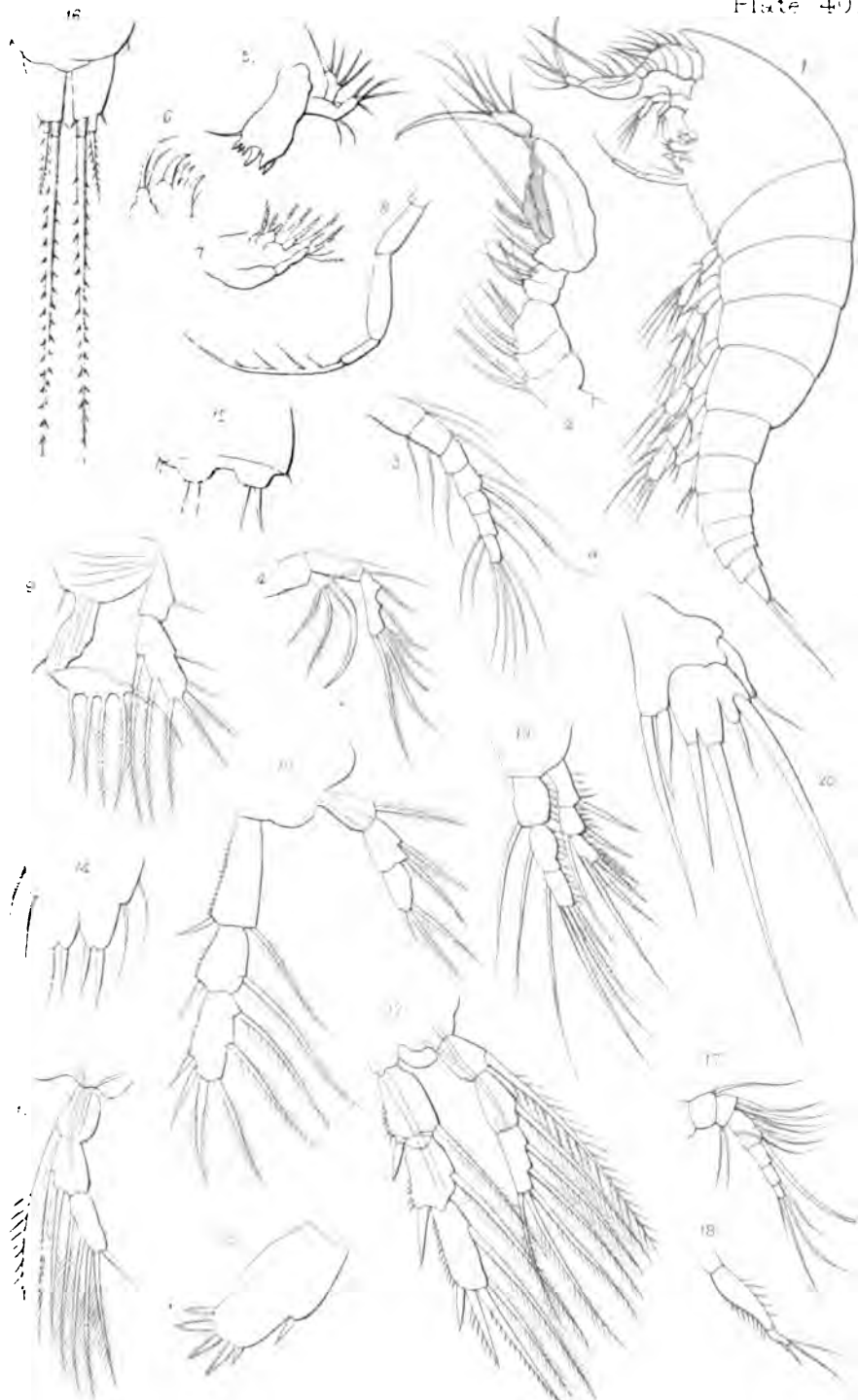
PLATE XL.

Euterpe gracilis.

- Fig. 1. Adult male.
2. Anterior antenna, male.
 3. Anterior antenna, female.
 4. Posterior antenna.
 5. Mandible.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. First foot.
 10. Second foot.
 11. Inner branch of third foot.
 12. Fourth foot.
 13. Fifth foot, female.
 14. Fifth foot, male.
 15. Appendages of first abdominal segment of male.
 16. Tail of male.

Ectinosoma melaniceps.

17. Anterior antenna.
18. Second foot-jaw.
19. First foot.
20. Fifth foot.



1-16. *Eutierpe gracilis*.
17-20. *Estinosoma melaniceps*.

PLATE XLI.

Robertsonia tenuis.

- Fig. 1. Adult female.
2. Anterior antenna, female.
3. Anterior antenna, male.
4. Posterior antenna.
5. Mandible.
6. Maxilla.
7. First foot-jaw.
8. Second foot-jaw.
9. First foot.
10. Third foot.
11. Inner branch of second foot, male.
12. Fifth foot, male.
13. Fifth foot, female.
14. Posterior abdominal segments and tail.

Mesochra Lilljeborgii.

15. Anterior antenna, female.
16. Anterior antenna, male.
17. Posterior antenna.
18. Mandible.
19. Second foot-jaw.
20. Fifth foot, male.
21. Posterior abdominal segments and tail.

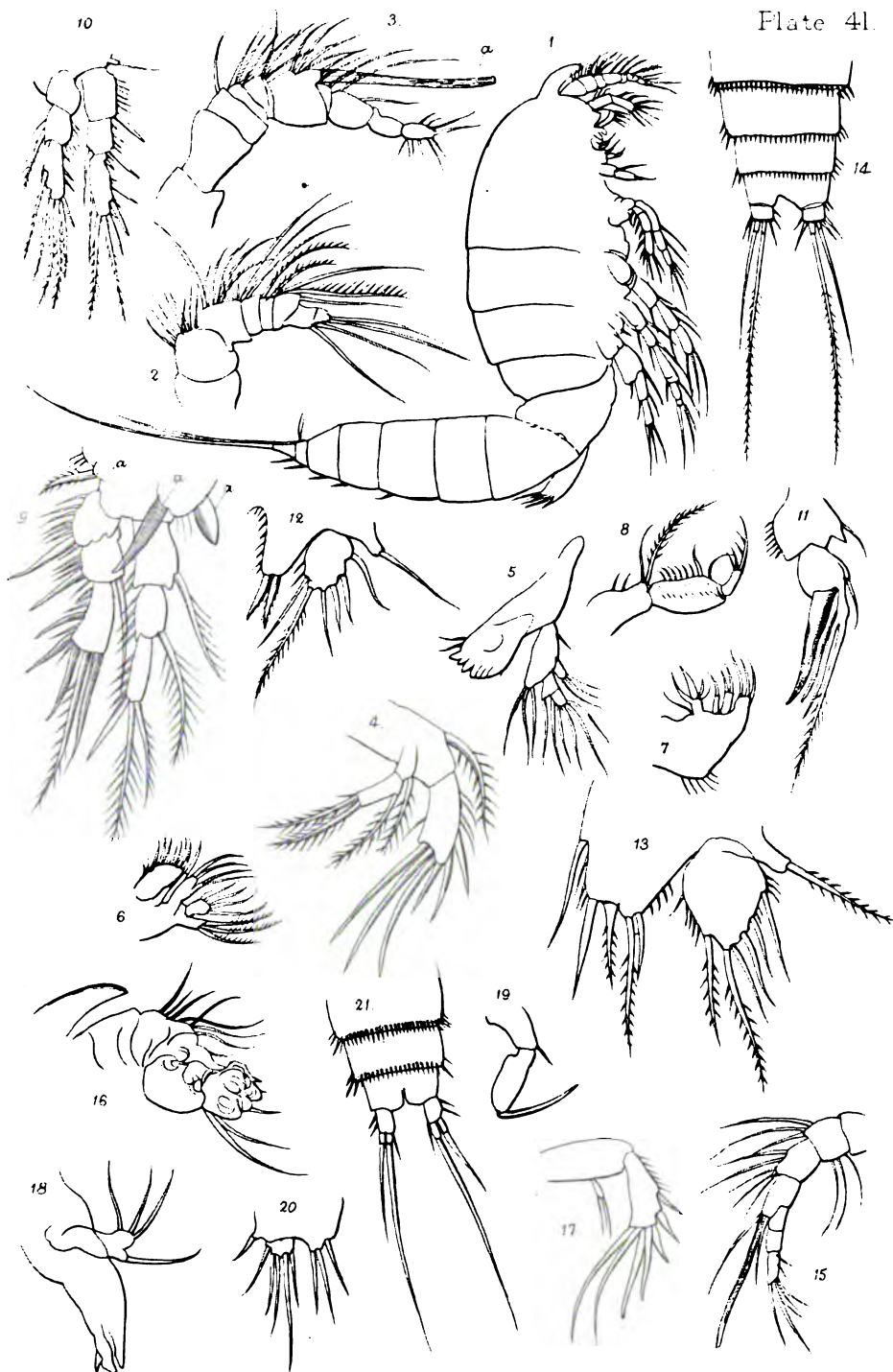


PLATE XLII.

Stenhelia hispida.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Inner branch of posterior antenna.
 5. Mandible and palp.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. First foot of male.
 10. Third foot.
 11. Second foot of male.
 12. Fifth foot, female.
 13. Fifth foot, male.
 14. Tail of female.



Stenhelea hispidula

PLATE XLIII.

Stenhelia ima.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Inner branch of posterior antenna.
 5. Mandible and palp.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. First foot.
 10. Inner branch of second foot, male.
 11. Fourth foot.
 12. Fifth foot, female.
 13. Fifth foot, male.
 14. One of tail segments.

Attheyella spinosa.

15. Anterior antenna, female.
16. Second foot-jaw.
17. First foot.
18. Fifth foot (variety),

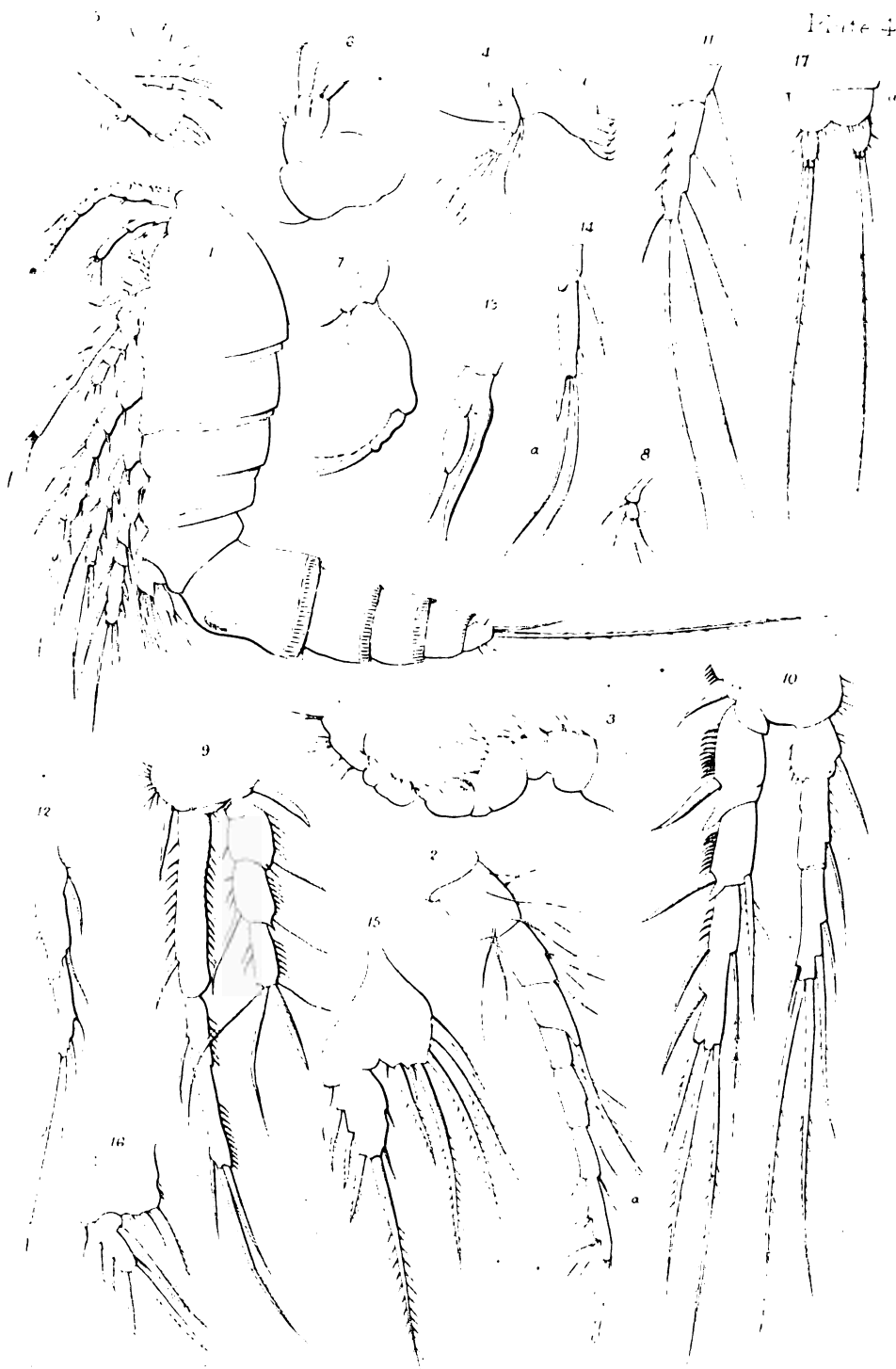


1-14. *Stenobothrus*
15-17. *Attheyella*

PLATE XLIV.

Canthocamptus minutus.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Mandible and palp.
 5. Maxilla.
 6. First foot-jaw.
 7. Second foot-jaw.
 8. Inner branch of posterior antenna.
 9. First foot.
 10. Third foot.
 11. Inner branch of first foot.
 12. Inner branch of second foot, male.
 13. Inner branch of third foot, male.
 14. Inner branch of fourth foot, male.
 15. Fifth foot, female.
 16. Fifth foot, male.
 17. Tail.



Canthocamptus minutus

PLATE XLV.

Canthocamptus Northumbricus.

- Fig. 1. Anterior antenna, female.
2. Anterior antenna, male.
3. Inner branch of posterior antenna.
4. Mandible and palp.
5. Maxilla.
6. First foot-jaw.
7. Second foot-jaw.
8. First foot.
9. Fourth foot.
10. Inner branch, second foot, male.
11. Inner branch, third foot, male.
12. Fifth foot, female.
13. Fifth foot, male.
14. Abdomen and tail, male.

Canthocamptus trispinosus.

15. Anterior antenna, female.
16. Inner branch of posterior antenna.
17. Mandible and palp.
18. First foot-jaw.
19. Second foot-jaw.
20. Inner branch of second foot.
21. Fifth foot, female.
22. Posterior abdominal segments and tail.



100000
200000

1-14. *Neotoma* (type)
15-22. *Neotoma* (type)

Neotoma (type)
15-22. *Neotoma* (type)

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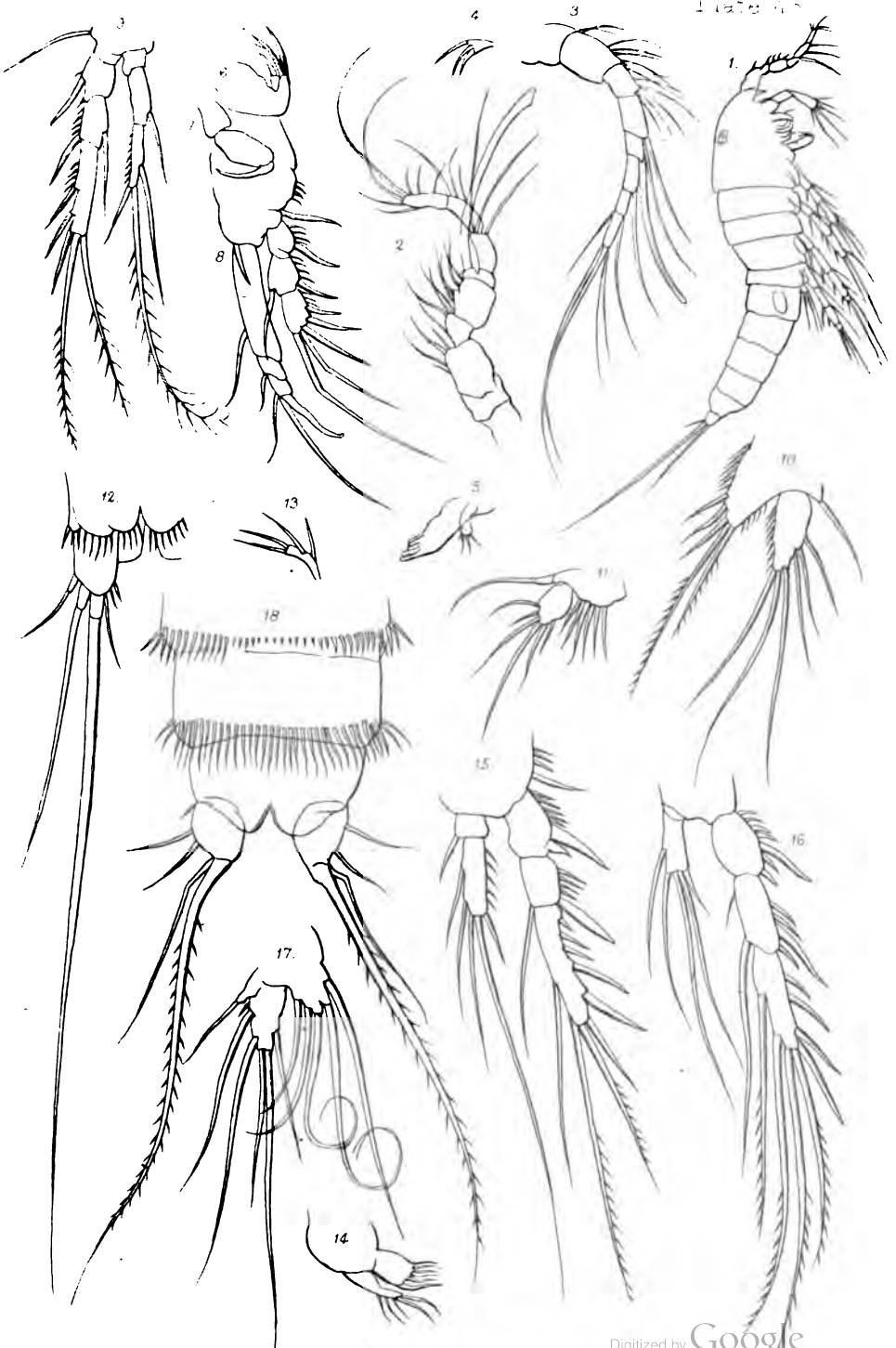
PLATE XLVI.

Canthocamptus hibernicus.

- Fig. 1. Adult male.
2. Anterior antenna, male.
3. Anterior antenna, female.
4. Inner branch of posterior antenna.
5. Mandible and palp.
6. First foot-jaw.
7. Second foot-jaw.
8. First foot.
9. Second foot.
10. Fifth foot, female.
11. Fifth foot, male.
12. One of the tail segments.

Attheyella spinosa.

13. Inner branch of posterior antenna.
14. Maxilla.
15. Second foot.
16. Fourth foot.
17. Fifth foot, female.
18. Posterior abdominal segments and tail.



1-12. *Anthracopterus hibernicus*
13-18. *Atine yella spinosa*.

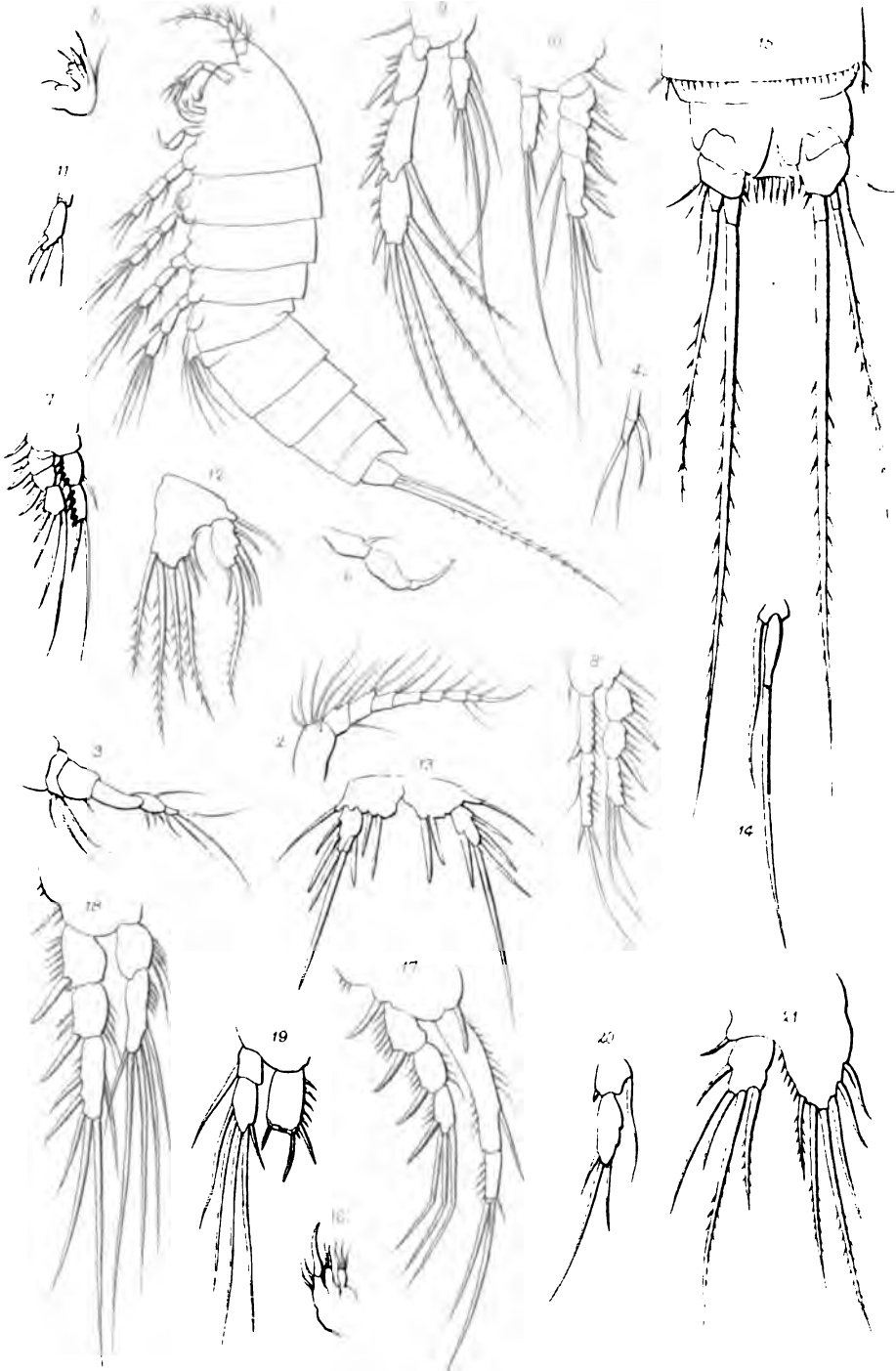
PLATE XLVII.

Mesochra Robertsoni.

- Fig. 1. Adult female.
2. Anterior antenna, female.
3. Anterior antenna, male.
4. Inner branch of posterior antenna.
5. First foot-jaw.
6. Second foot-jaw.
7. First foot, female.
8. First foot, male.
9. Second foot.
10. Third foot.
11. Inner branch of fourth foot.
12. Fifth foot, female.
13. Fifth foot, male.
14. Inner branch of second foot, male.
15. Tail.

Mesochra Lilljeborgii.

16. First foot-jaw.
17. First foot.
18. Second foot.
19. Inner, and part of outer, branch of fourth
foot, female.
20. Inner branch of fourth foot, male.
21. Fifth foot, female.



11. 1/2000
12. 1/2000

1-15. Mesocobra Robertsoni
16-21. Mesocobra Linneborghii

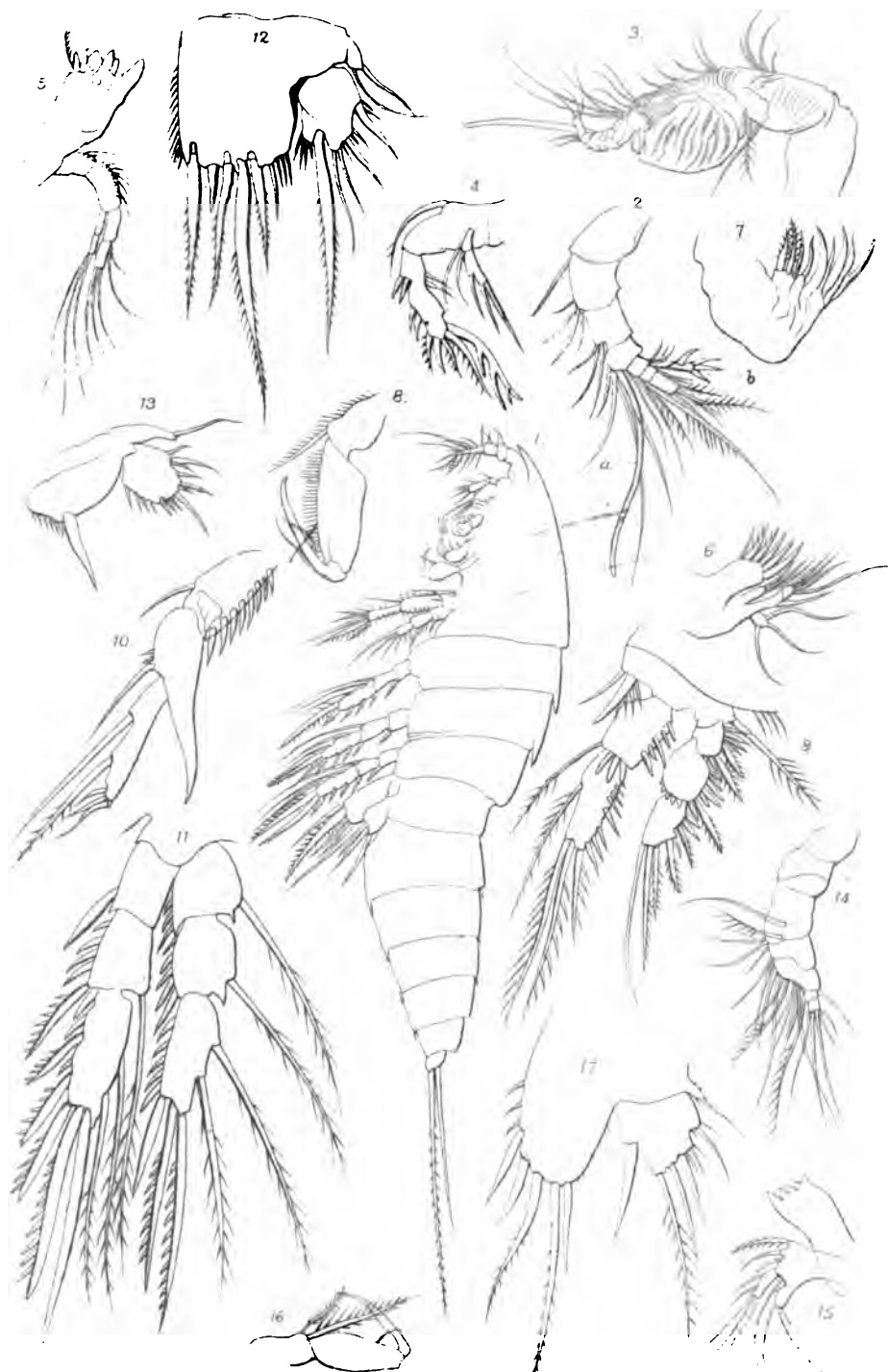
PLATE XLVIII.

Jonesiella fusiformis.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Posterior antenna.
 5. Mandible and palp.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. First foot.
 10. Inner branch of second foot, male.
 11. Third foot.
 12. Fifth foot, female.
 13. Fifth foot, male.

Jonesiella spinulosa.

14. Anterior antenna, female.
15. Mandible and palp.
16. Second foot-jaw.
17. Fifth foot, female.



1-5 B. de la.
6-7 H. de la.

1-13 *Jonesiella fasciformis*
14-17 *Jonesiella spiralis*

fasciformis
spiralis

Digitized by Google

PLATE XLIX.

Amymone sphærica.

- Fig. 1. Adult female.
2. Anterior antenna, male.
3. Posterior antenna.
4. Mandible and palp.
5. Maxilla.
6. First foot-jaw.
7. Second foot-jaw.
8. First foot.
9. Third foot.
10. Fifth foot, female.
11. Fifth foot, male.

Amymone longimana.

12. Anterior antenna, male.
13. Posterior foot-jaw.

Jonesiella spinulosa.

14. First foot.
15. Third foot.



1-11 *Arxymene sphaerica*
 12-13 *longimana*
 14-15 *Jonesiella spinulosa*

PLATE L.

Delavalia palustris (female).

- Fig. 1. Adult female.
2. Anterior antenna.
 3. Posterior antenna.
 4. Mandible and palp.
 5. Maxilla.
 6. First foot.
 7. Third foot.
 8. Fifth foot.

Thalestris harpactoides.

9. Anterior antenna, female.
10. Inner branch of posterior antenna.
11. Maxilla.
12. Second foot-jaw.
13. Inner branch of second foot, male.
14. Fifth foot, female.
15. Fifth foot, male.
16. Abdomen of female.

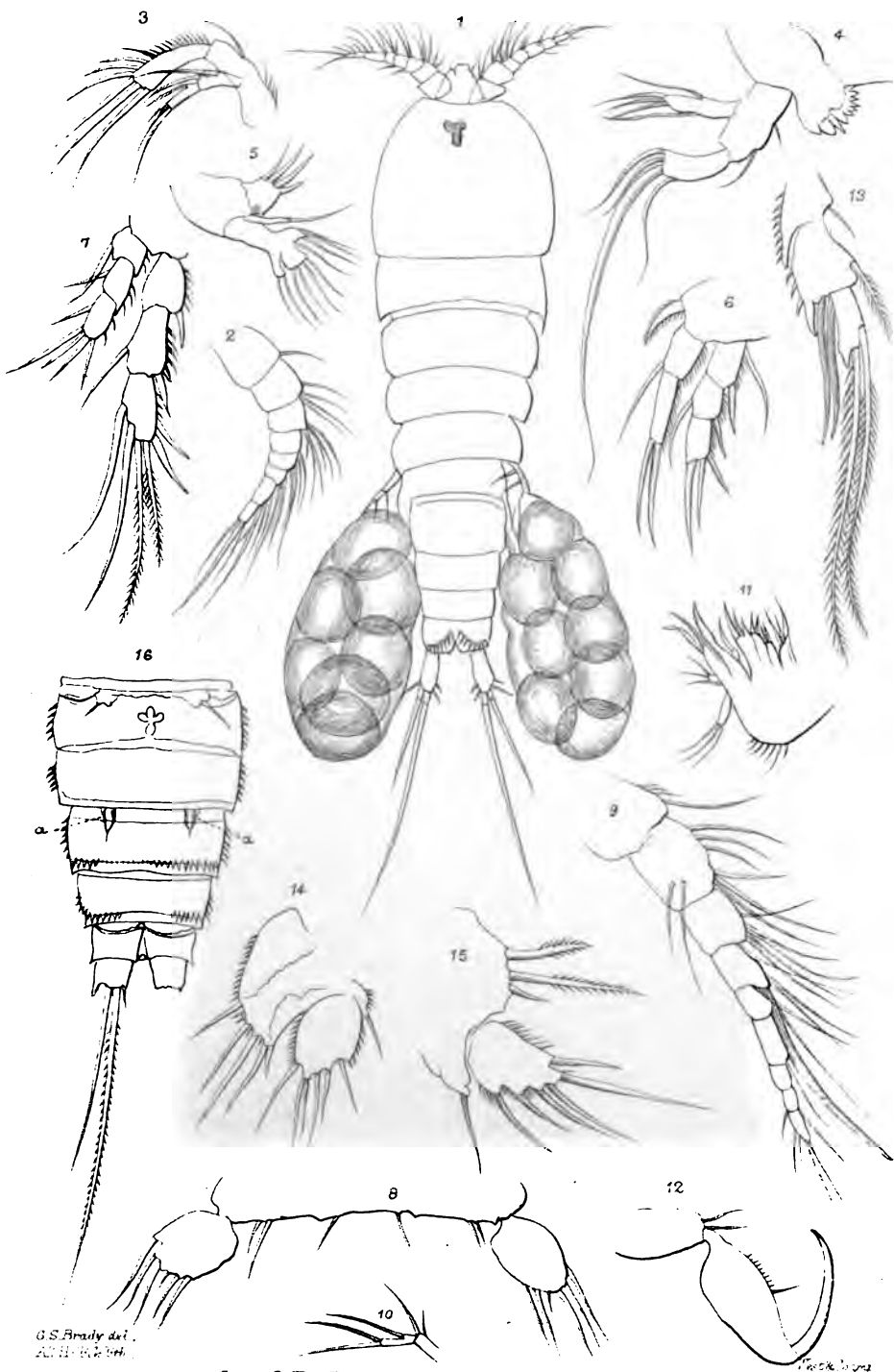


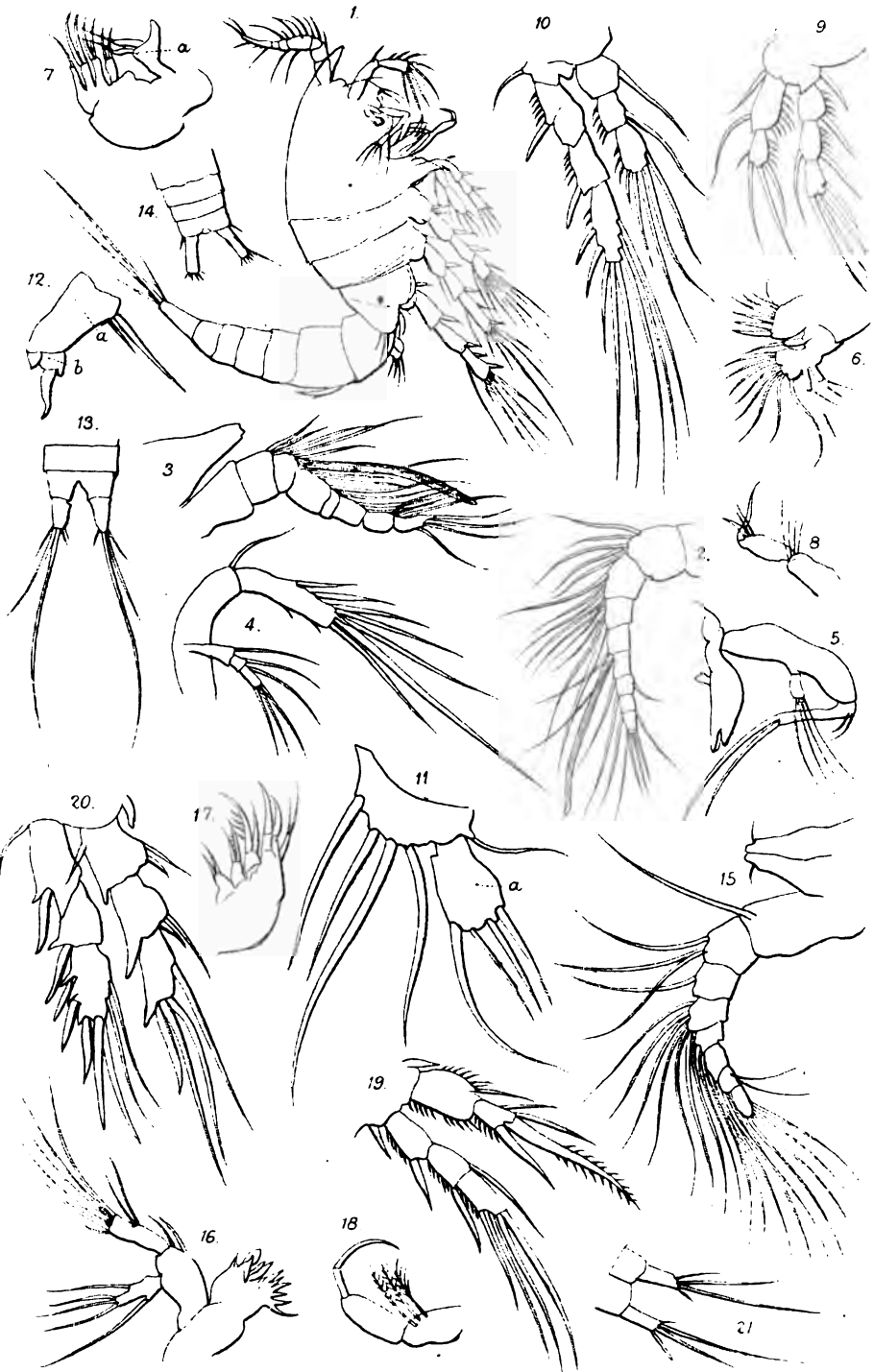
PLATE LI.

Delavalia reflexa.

- Fig. 1. Adult male.
2. Anterior antenna, female.
3. Anterior antenna, male.
4. Posterior antenna.
5. Mandible and palp.
6. Maxilla.
7. First foot-jaw.
8. Second foot-jaw.
9. First foot.
10. Second foot.
11. Fifth foot, female.
12. Fifth foot, male.
13. Caudal segments, female.
14. Caudal segments, male.

Delavalia robusta (female).

15. Anterior antenna, female.
16. Mandible and palp.
17. First foot-jaw.
18. Second foot-jaw.
19. First foot.
20. Second foot.
21. Caudal segments.



J. E. Brady del.
A. T. Hollick lith.

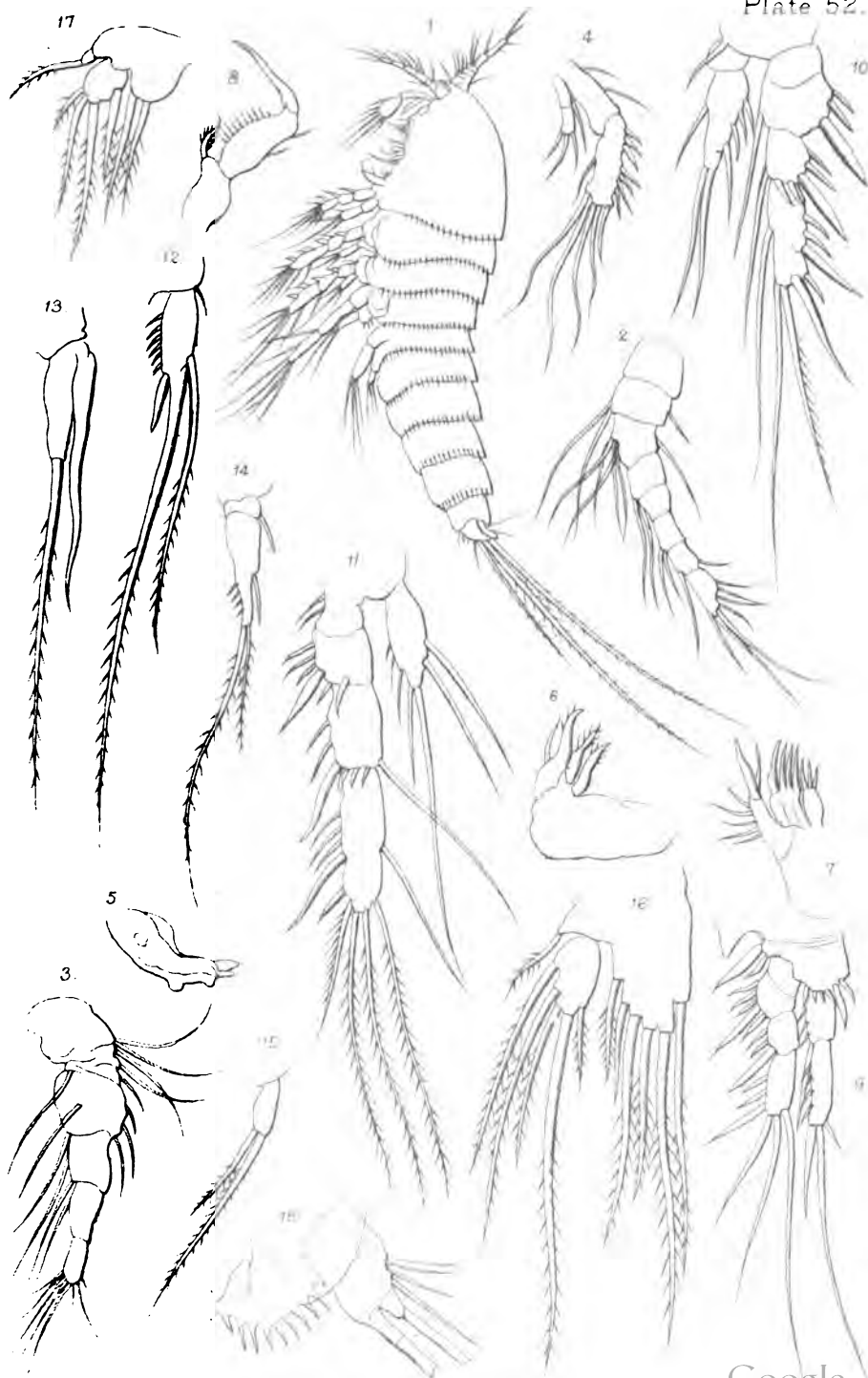
1-14. *Delavalia reflexa*
15-21 *Delavalia robusta*.

Digitized by Google

PLATE LII.

Attheyella cryptorum.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Posterior antenna.
 5. Mandible.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. First swimming foot.
 10. Second foot.
 11. Fourth foot.
 12. Inner branch of third foot, female.
 13. Inner branch of second foot, male.
 14. Inner branch of third foot, male.
 15. Inner branch of fourth foot, male.
 16. Fifth foot, female.
 17. Fifth foot, male.
 18. Anal operculum and base of tail.



Arnevelia cryptorum

PLATE LIV.

Dactylopus tisboides.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Posterior antenna.
 5. Mandible and palp.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. First foot.
 10. Inner branch of second foot, male.
 11. Fourth foot.
 12. Fifth foot, female.
 13. Fifth foot, male.
 14. Anterior antenna, female,
 15. Fifth foot, female,
 16. Fifth foot, male,
- } brackish water
variety.

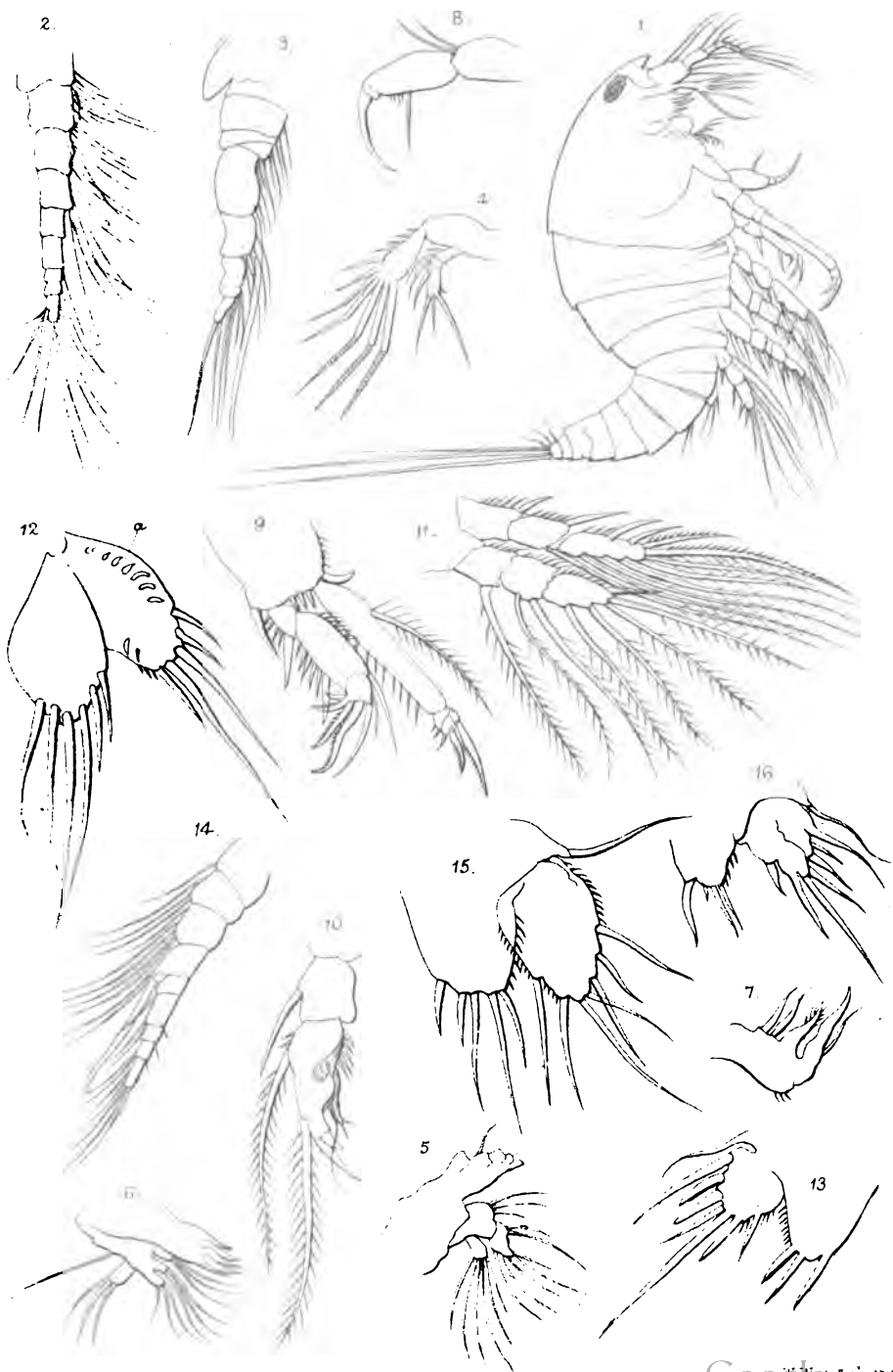


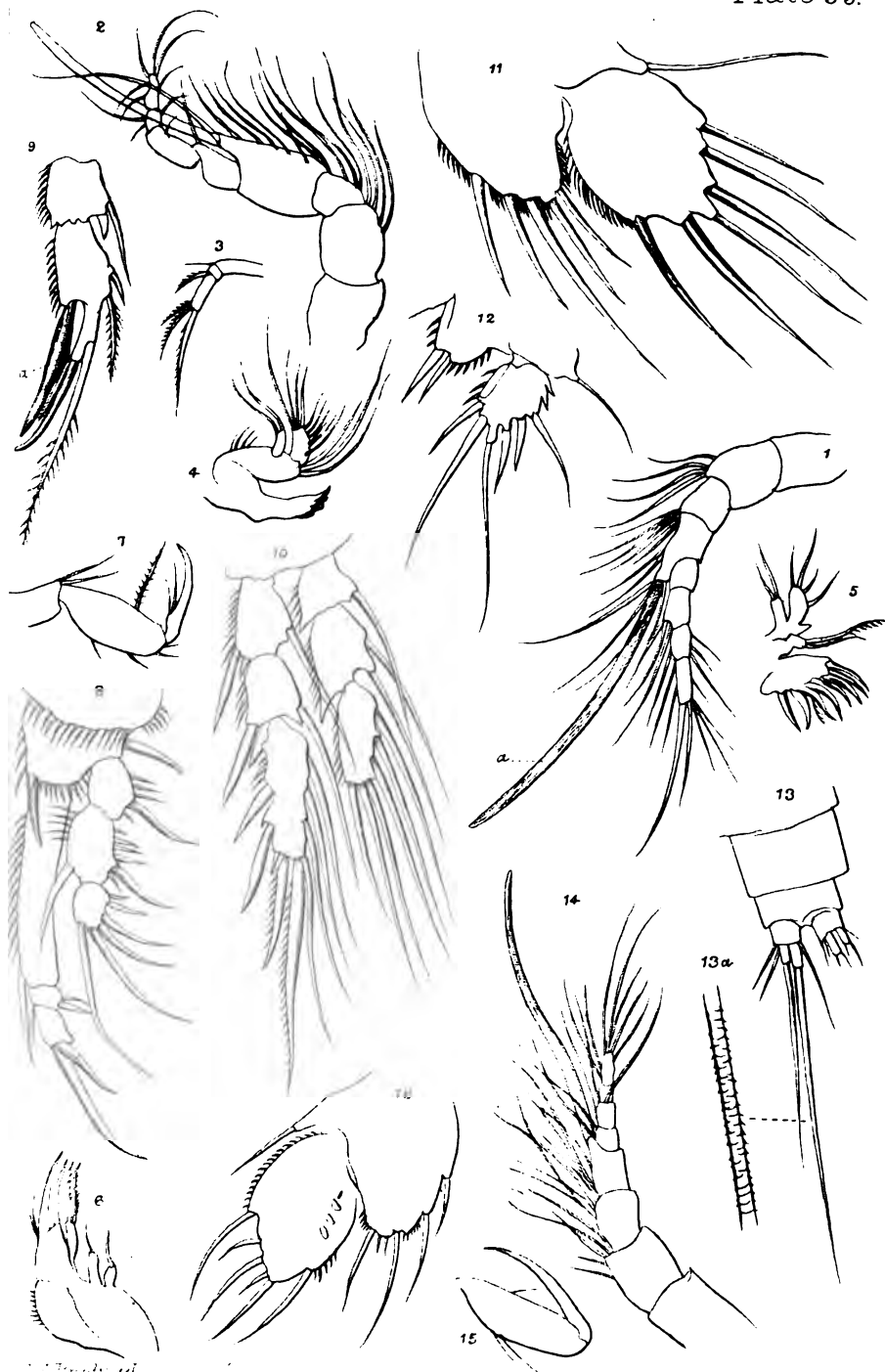
PLATE LV.

Dactylopus Stromii.

- Fig. 1. Anterior antenna, female.
2. Anterior antenna, male.
3. Inner branch of posterior antenna.
4. Mandible and palp.
5. Maxilla.
6. First foot-jaw.
7. Second foot-jaw.
8. First foot.
9. Inner branch of second foot, male.
10. Third foot.
11. Fifth foot, female.
12. Fifth foot, male.
13. Tail; *a*, portion of seta more highly magnified.

Dactylopus similis.

14. Anterior antenna, female.
15. Second foot-jaw.
16. Fifth foot, female.



1--13 *Dactylopus Stromii*.
14-15 " *similis*.

W. West & Co. imp.

PLATE LVI.

Dactylopus flavus.

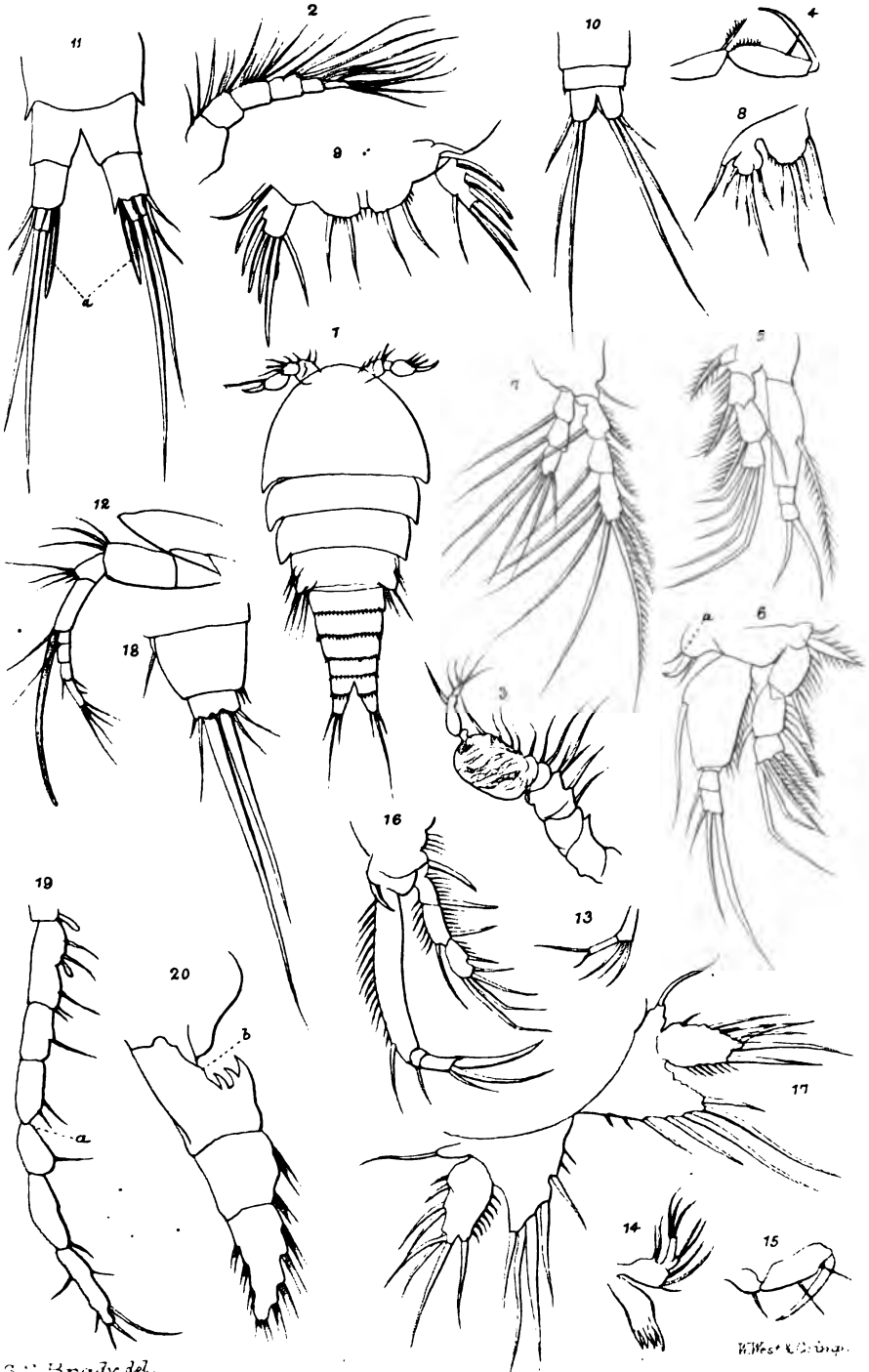
- Fig. 1. Adult male.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Second foot-jaw.
 5. First foot, female.
 6. First foot, male.
 7. Third foot.
 8. Fifth foot, female.
 9. Fifth foot, male.
 10. Tail of female.
 11. Tail of male.

Dactylopus tenuiremis.

12. Anterior antenna.
13. Inner branch of posterior antenna.
14. Mandible and palp.
15. Second foot-jaw.
16. First foot.
17. Fifth foot.
18. One of the tail segments.

Metridia armata.

19. End of right anterior antenna of male.
20. Inner branch of second foot of male.



G. B. Brady del.
A. T. Holsbeck lith.

W. H. & C. Co. Inc.

1-11 *Dactylopus flavus*.
12-13 *tenuiremis*.
19-20 *Metridia armata* ♂

Digitized by Google

PLATE LVII.

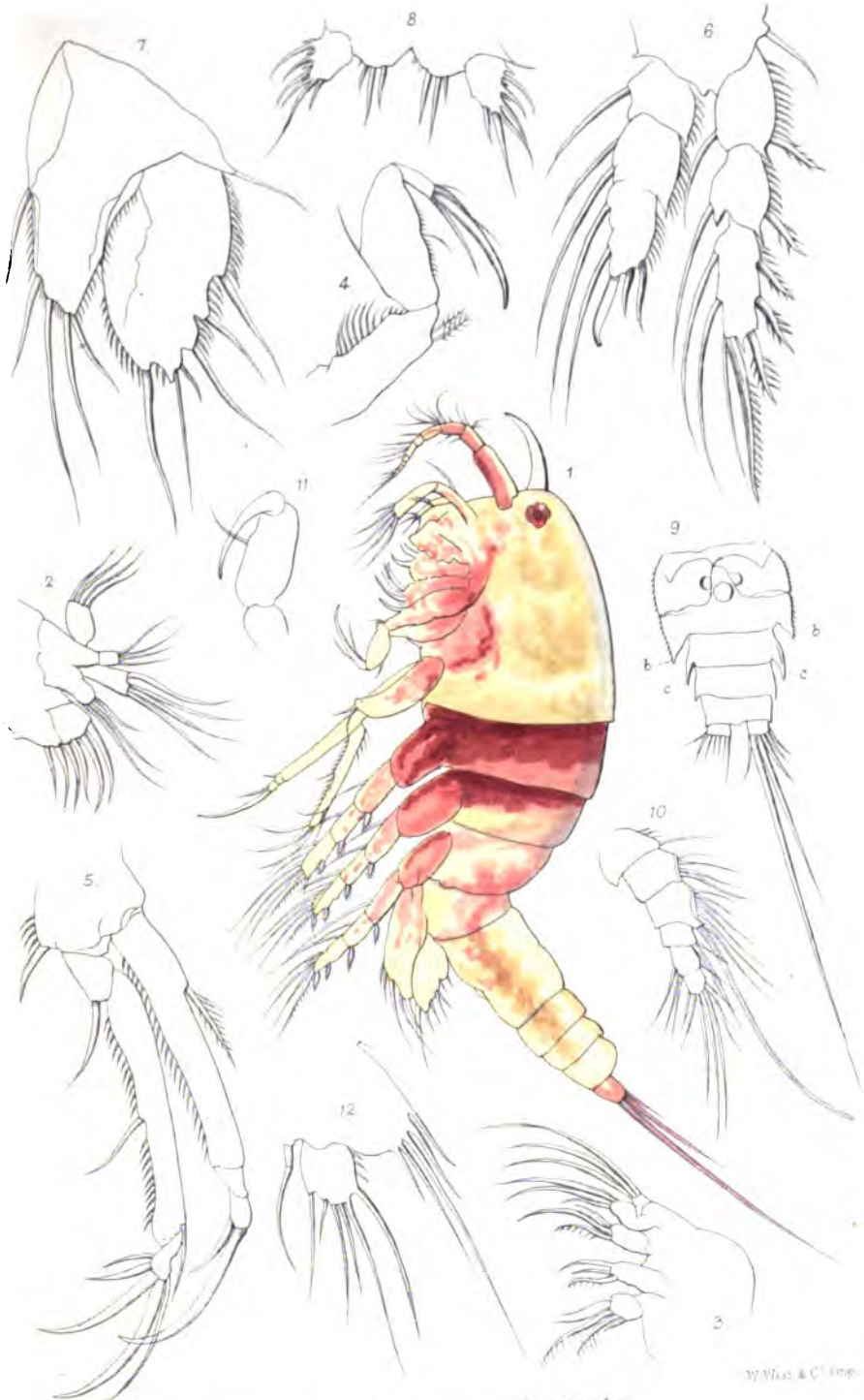
Thalestris rufocincta.

- Fig. 1. Adult female.
2. Maxilla.
3. First foot-jaw.
4. Second foot-jaw.
5. First foot.
6. Second foot of male.*
7. Fifth foot of female.
8. Fifth foot of male.
9. Abdomen of female.

Dactylopus brevicornis.

10. Anterior antenna, female.
11. Second foot-jaw.
12. Fifth foot, female.

* The letters *a a*, referring to the aculeate margins, are omitted in the plate.



W. H. S. & C. S. Comp.

1-5 Brady da
A-H H. H. S. S.

1-9. *Thalestris rufocincta*
10-12. *Dactylopus brevicornis*

Digitized by Google

PLATE LVIII.

Thalestris mysis.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Inner branch of posterior antenna.
 5. Mandible palp.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. First foot.
 10. Inner branch of second foot, male.
 11. Second foot, female.
 12. Fifth foot, female.
 13. Fifth foot, male.

Dactylopus brevicornis.

14. First foot.



♂ ♂ Brady 1911
 ♂ ♂ H. M. 1911

1-13 *Thalestria Mysis*
 14 *Diactyopus brevicornis*

W. West, 1911

PLATE LIX.

Thalestris harpactoides.

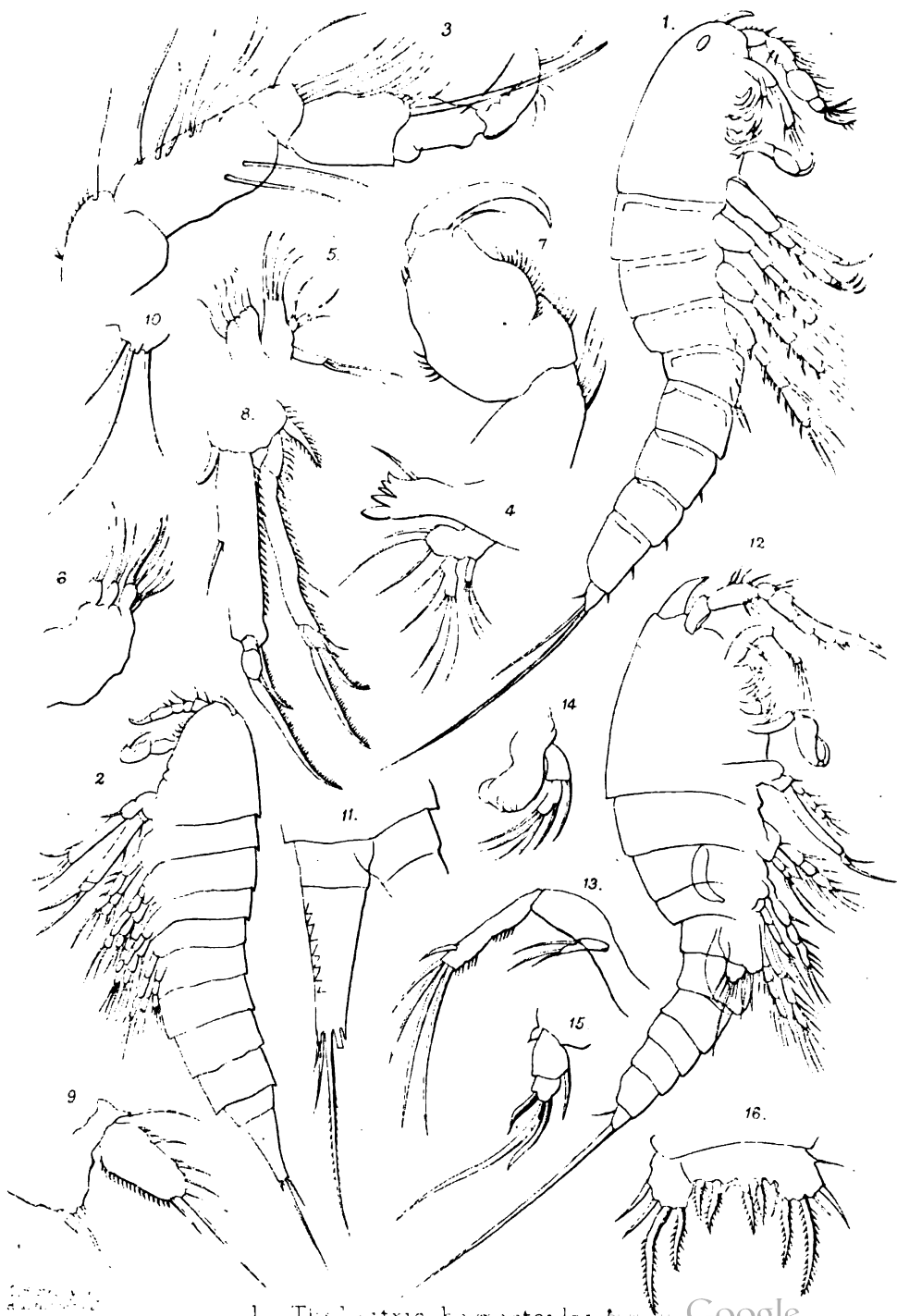
Fig. 1. Adult male.

Thalestris serrulata, male.

2. Adult animal.
3. Anterior antenna.
4. Mandible.
5. Maxilla.
6. First foot-jaw.
7. Second foot-jaw.
8. First foot.
9. Fifth foot.
10. Appendage of first abdominal segment.
11. Tail.

Diosaccus tenuicornis.

12. Adult male.
13. Posterior antenna.
14. Mandible and palp.
15. Inner branch of second foot, male.
16. Fifth foot, male.



1. *Thidestris harpactoides* ♂
 2-11 " *serrulata* ♂
 12-16 *Diastoeus tenuicornis* ♂

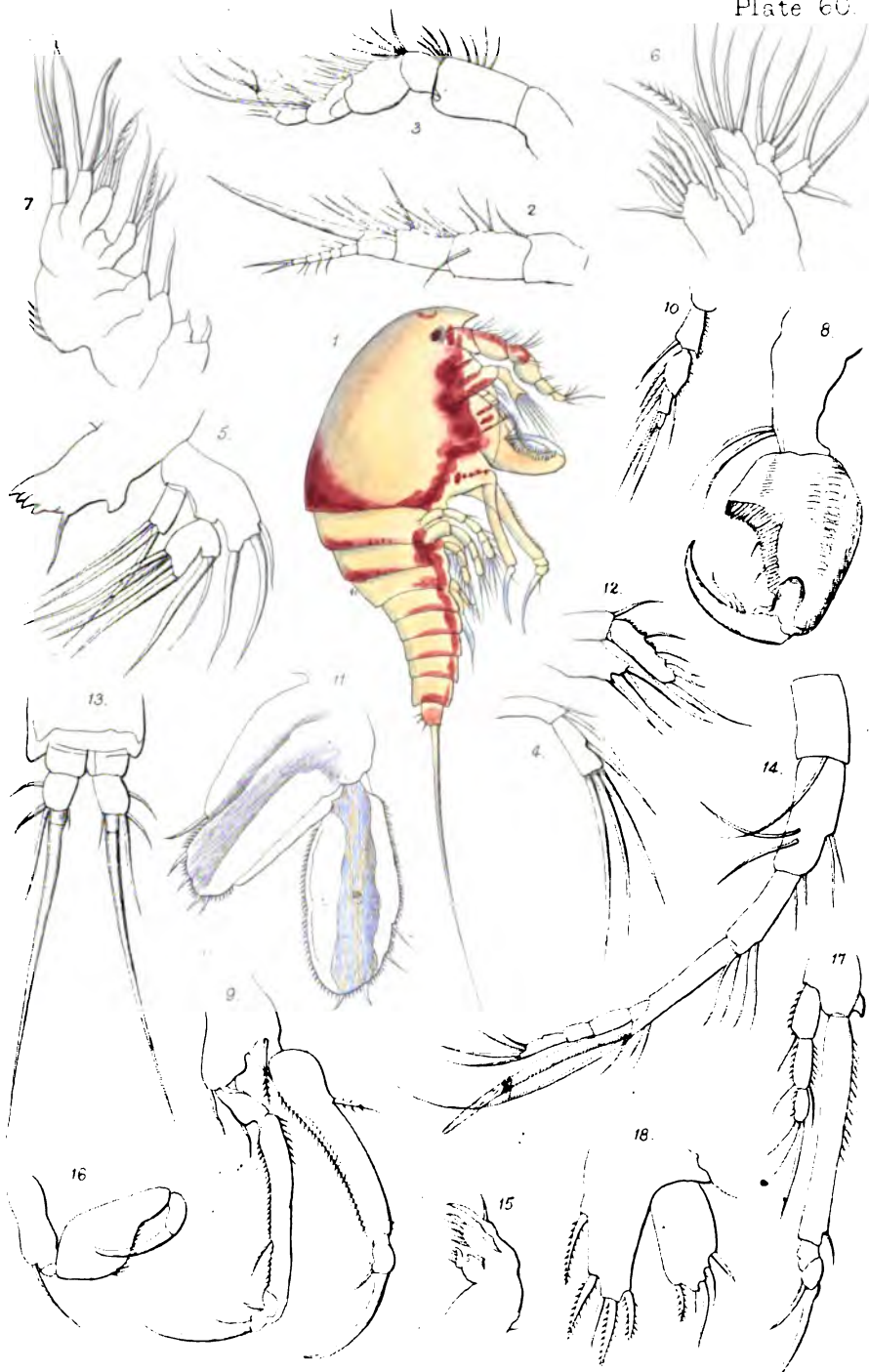
PLATE LX.

Thalestris longimana.

- Fig. 1. Adult male.
2. Anterior antenna, female.
3. Anterior antenna, male.
4. Inner branch of posterior antenna.
5. Mandible.
6. Maxilla.
7. First foot-jaw.
8. Second foot-jaw.
9. First foot.
10. Inner branch, second foot, male.
11. Fifth foot, female.
12. Fifth foot, male.
13. Tail.

Diosaccus tenuicornis.

14. Anterior antenna, female.
15. First foot-jaw.
16. Second foot-jaw.
17. First foot.
18. Fifth foot, female.



G. S. Emery del.
AT Hollick lith.

1-13. *Thalestris longimana*.

14-18. *Diosaccus tenuicornis* ♀

W. West & Co. lith.

Digitized by Google

PLATE LXI.

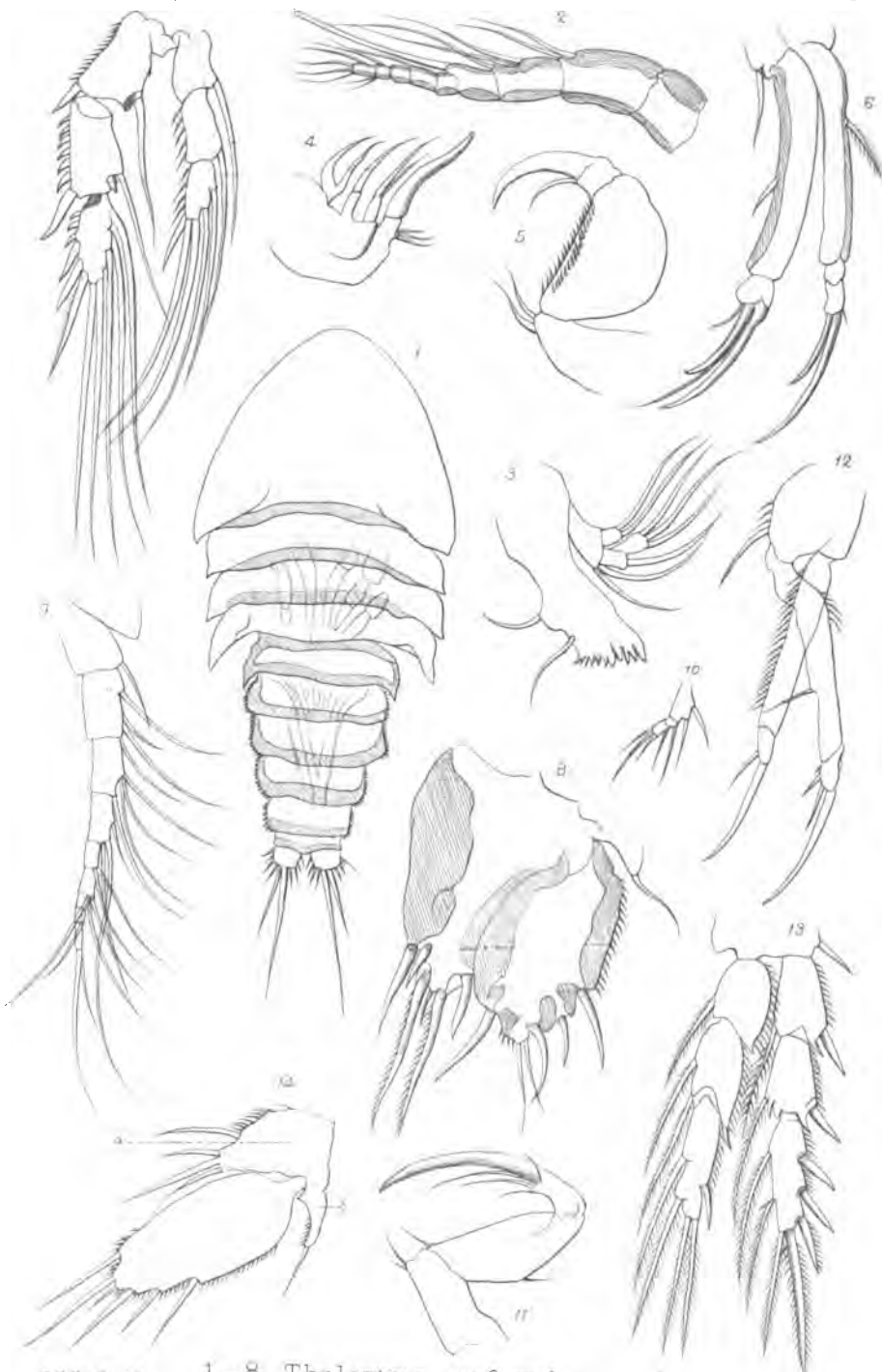
Thalestris rufoviolascens, female.

- Fig. 1. Adult animal.
2. Anterior antenna.
3. Mandible.
4. First foot-jaw.
5. Second foot-jaw.
6. First foot.
7. Fourth foot.
8. Fifth foot.

Thalestris helgolandica, female.

9. Anterior antenna.
10. Inner branch of posterior antenna.
11. Second foot-jaw.
12. First foot.
13. Third foot.
14. Fifth foot.

7.



5557-My. det.
A.T.H. Tuck. det.

1-8. *Thalestris rufoviolascens* ♀
9-14. " *helgolandica* ♀

W. H. & Co. det.

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Google

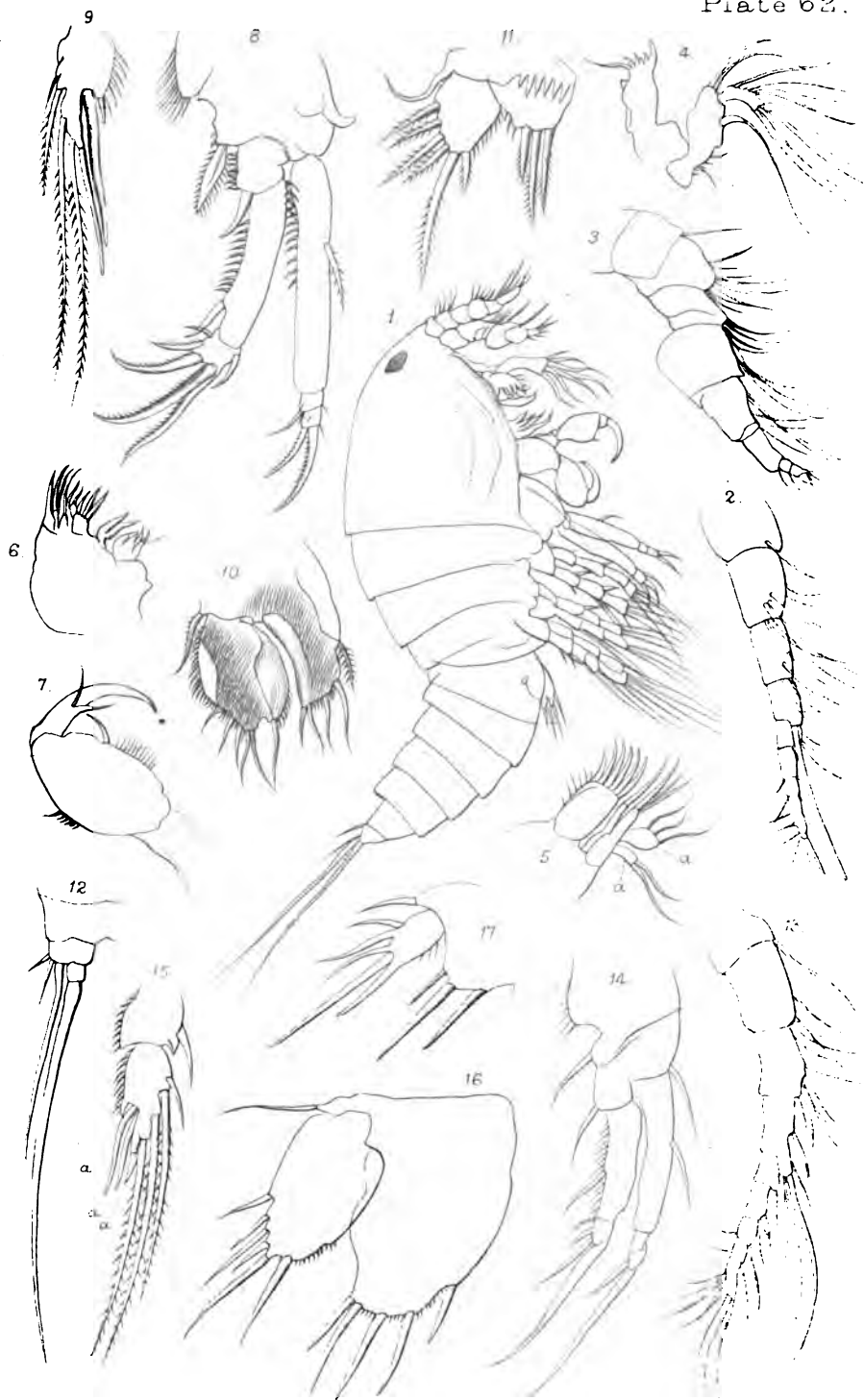
PLATE LXII.

Thalestris Clausii.

- Fig. 1. Adult male.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Mandible.
 5. Maxilla.
 6. First foot-jaw.
 7. Second foot-jaw.
 8. First foot.
 9. Inner branch of second foot, male.
 10. Fifth foot, female.
 11. Fifth foot, male.
 12. Tail segment.

Thalestris hibernica.

13. Anterior antenna, female.
14. First foot.
15. Inner branch, second foot, male.
16. Fifth foot, female.
17. Fifth foot, male.



18 Brady, 1876.
 19 H. S. G. 1876.

1 - 12.
 13 - 17.

Thalestris
 "

clausii
hibernica

Digitized by Google

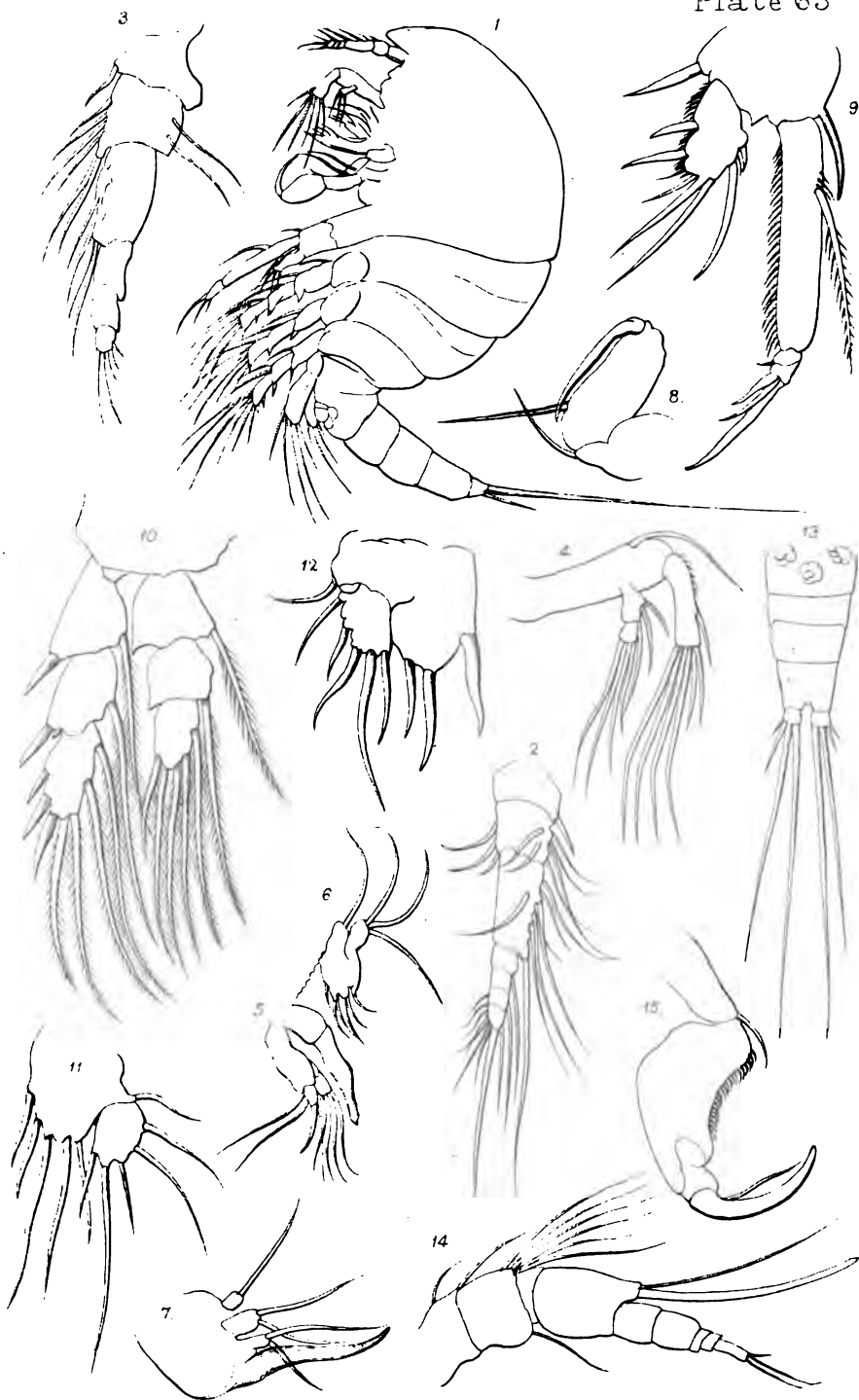
PLATE LXIII.

Westwoodia nobilis.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Posterior antenna.
 5. Mandible.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. Foot of first pair.
 10. Foot of second pair, female.
 11. Foot of fifth pair, female.
 12. Foot of fifth pair, male.
 13. Abdomen and tail, female.

Thalestris hibernica.

14. Anterior antenna, male.
15. Second foot-jaw.



18. B. G. 10.
A. 1. 1. 1. 1. 1.

1-13. *Westwoodia nobilis*.
14, 15. *Thalestris hibernica*

W. H. & C. Co. 1890.
Digitized by Google

PLATE LXIV.

Harpacticus fulvus.

- Fig. 1. Anterior antenna, female.
2. Posterior antenna, male.
3. Inner branch of posterior antenna.
4. Maxilla.
5. Second foot-jaw.
6. Foot of first pair ; *a*, end of outer branch, more highly magnified.
7. Inner branch, second foot, male.
8. Foot of third pair.
9. Foot of fifth pair, female.
10. Foot of fifth pair, male.
11. Tail.

Harpacticus flexus.

12. Anterior antenna, female.
13. Anterior antenna, male.
14. Second foot-jaw.
15. Foot of first pair.
16. Inner branch of second foot, male.
17. Foot of fifth pair, female.
18. Foot of fifth pair, male.



1-11 Harpactonius fulvus
12-18 " flexus
19, 20 " chelifer.

1-11 Harpactonius fulvus
12-18 " flexus
19, 20 " chelifer.

19-20 chelifer.

Digitized by Google

PLATE LXV.

Harpacticus chelifer.

- Fig. 1. Adult female.
2. Anterior antenna, female
 3. Anterior antenna, male.
 4. Posterior antenna; *a*, spine of the same more highly magnified.
 5. Mandible and palp.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. Foot of first pair.
 10. Foot of first pair, variety.
 11. Inner branch of second foot, male.
 12. Foot of fifth pair, female.
 13. Foot of fifth pair, female, variety.
 14. Foot of fifth pair, male.
 15. Abdominal segments and tail.



1. Body of *Harpacticus shelifer*.

2. Antenna 1.

Harpacticus shelifer.

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PLATE LXVI.

Zaus spinatus.

- Fig. 1. Adult female.
2. Anterior antenna, male.
 3. Posterior antenna.
 4. Extremity of same, more highly magnified.
 5. Mandible and palp.
 6. Second foot-jaw.
 7. Foot of first pair.
 8. Apex of outer branch of second, third, and fourth swimming feet.
 9. Foot of fifth pair, female.

Zaus Goodsiri.

10. Adult female.
11. Anterior antenna, male.
12. Foot of first pair.
13. Foot of fifth pair, female.



1-9 *Tanus spinatus*.
10-16 *T. spinatus*.

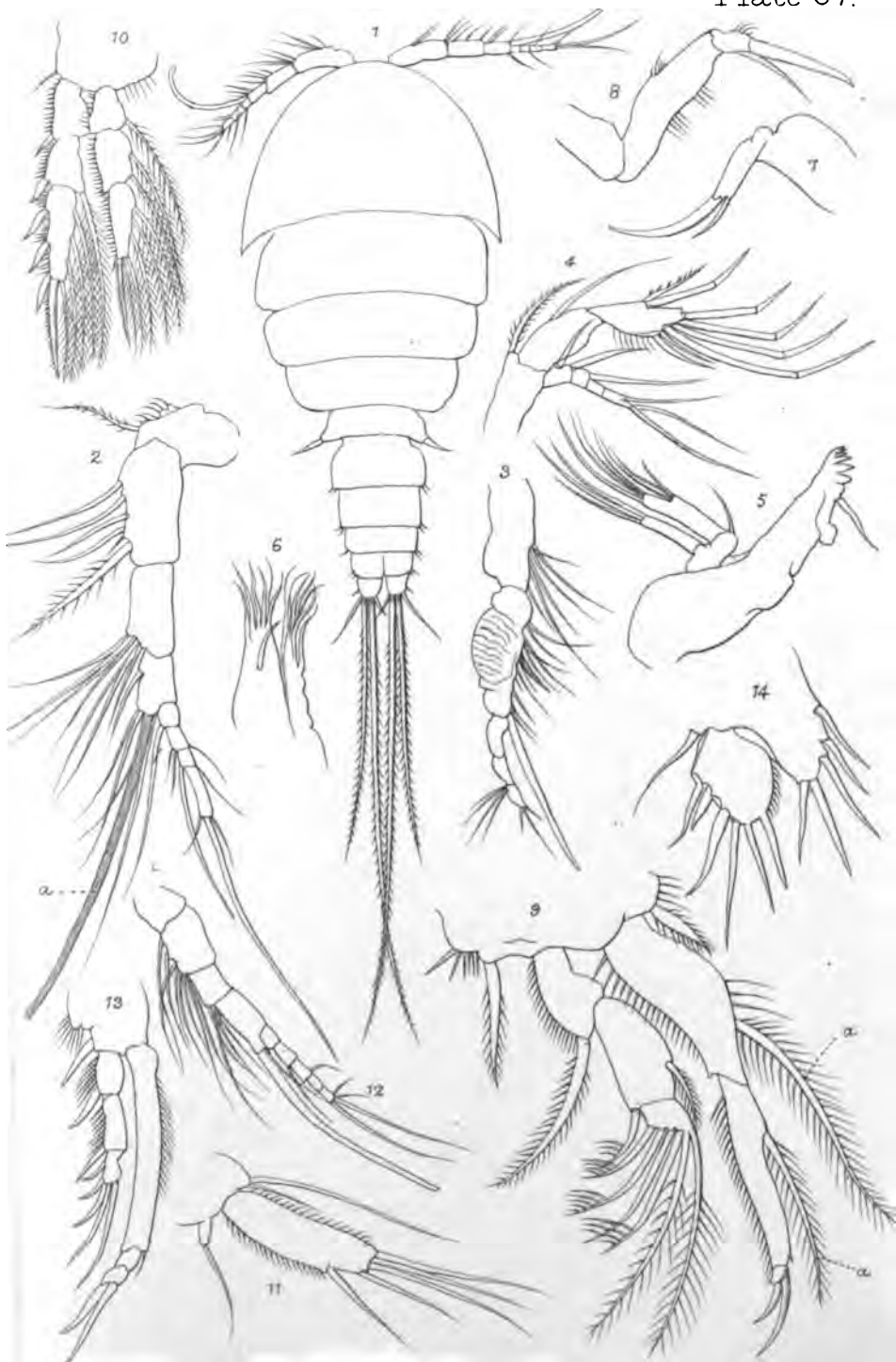
PLATE LXVII.

Idya furcata.

- Fig. 1. Adult female.
2. Anterior antenna, female ; *a*, olfactory appendage.
 3. Anterior antenna, male.
 4. Posterior antenna.
 5. Mandible.
 6. Maxilla.
 7. First foot-jaw.
 8. Second foot-jaw.
 9. Foot of first pair.
 10. Foot of third pair.
 11. Foot of fifth pair, female.

Dactylopus minutus.

12. Anterior antenna, female.
13. Foot of first pair.
14. Foot of fifth pair, female.



1-11 *Idya furcata*.
12-14 *Dactylopus minutus*.

G. S. Brady del.
A. H. S. J. G. lith.

W. West & Co.
Digitized by Google

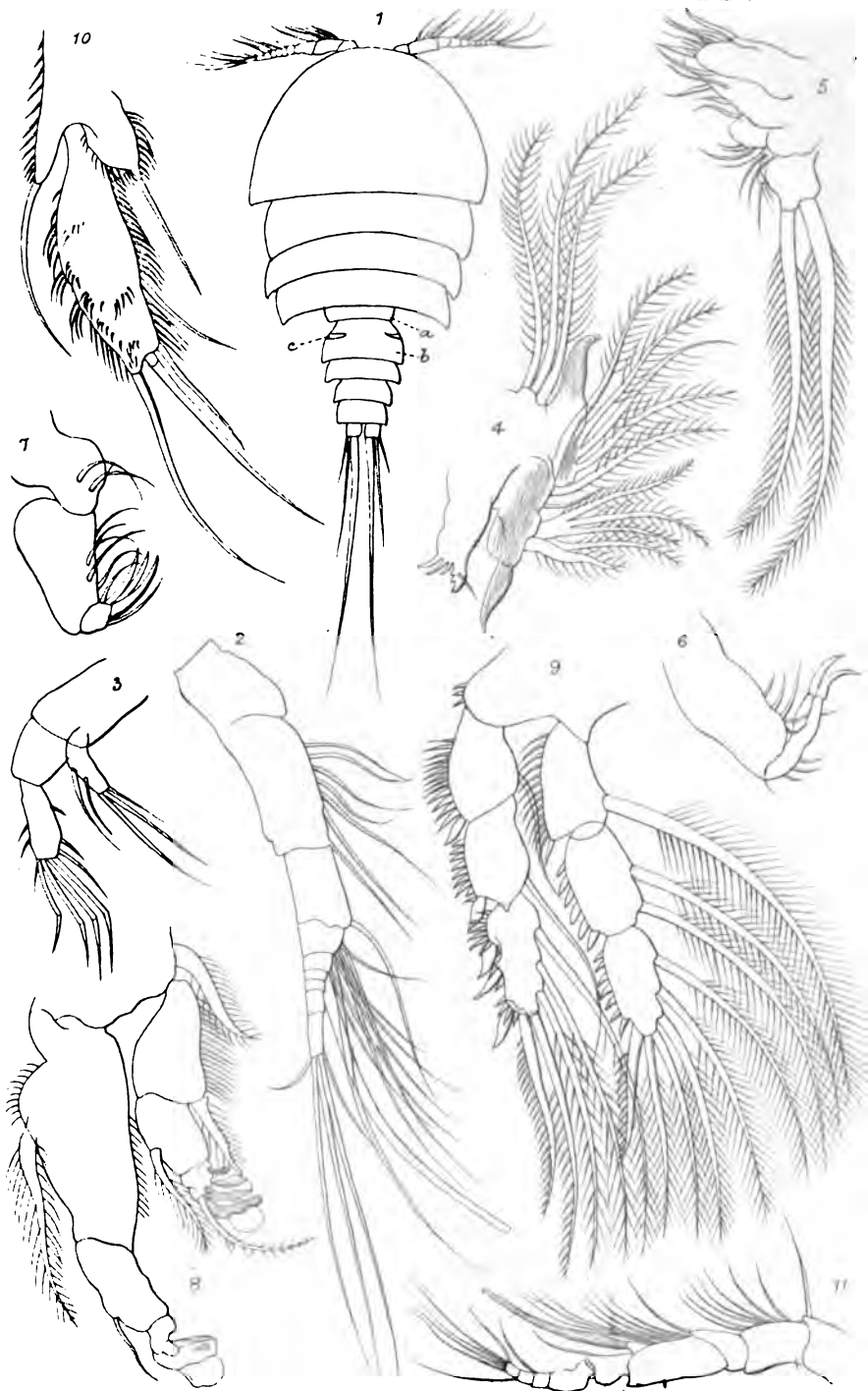
PLATE LXVIII.

Scutellidium tisboides.

- Fig. 1. Adult female ; *a*, last thoracic segment ; *b*, first abdominal segment ; *c*, chitinous bands.
2. Anterior antenna, female.
 3. Posterior antenna.
 4. Mandible and palp.
 5. Maxilla and palp.
 6. First foot-jaw.
 7. Second foot-jaw.
 8. Foot of first pair.
 9. Foot of third pair.
 10. Foot of fifth pair, female.

Scutellidium fasciatum.

11. Anterior antenna, male.



G.S. Brady del.
A.T.H. Duk lith.

1-10 *Scutellidium tisburyi* ♀
11 " *fasciatum* ♂

W. H. S. & Co. del.

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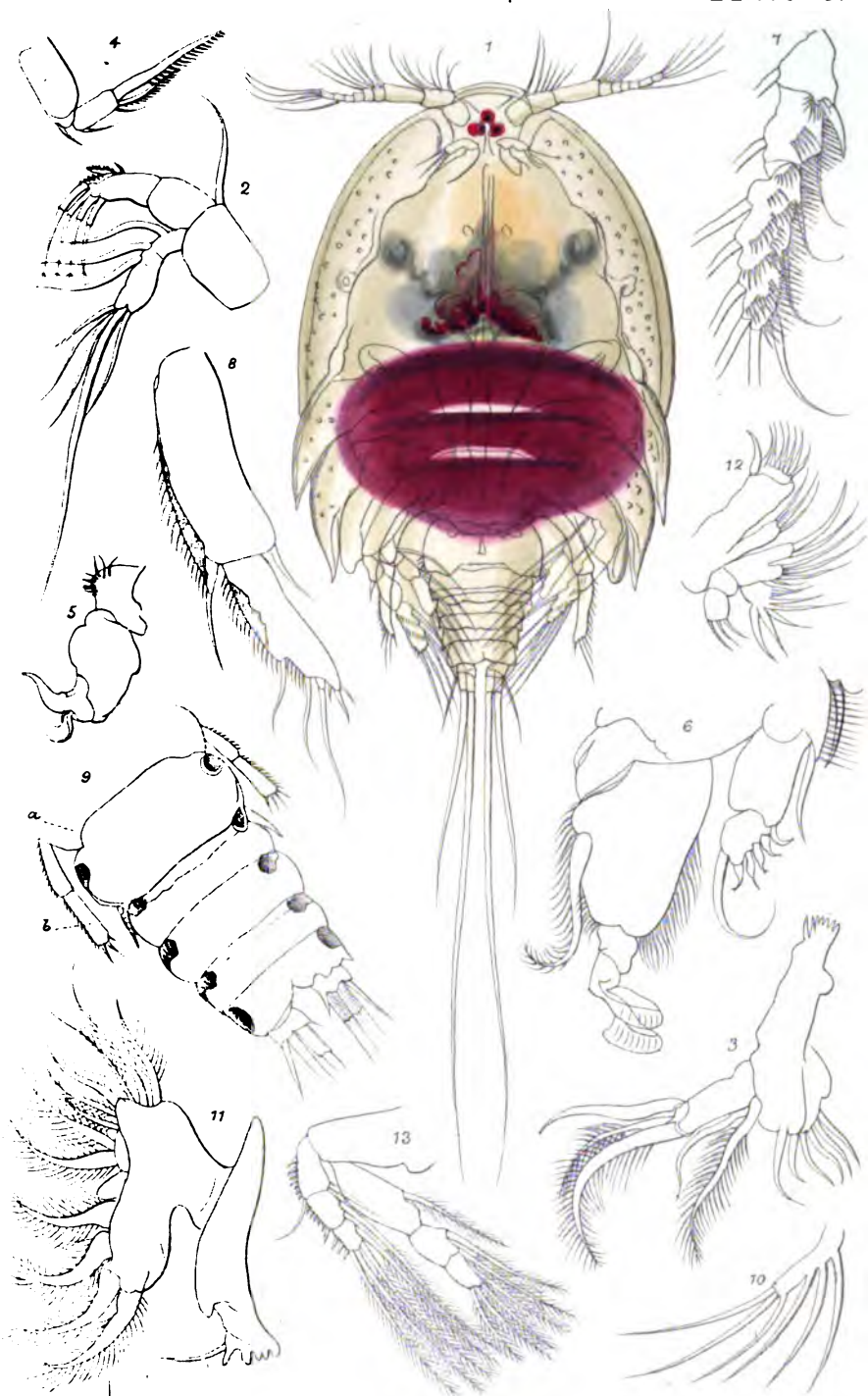
PLATE LXIX.

Scutellidium fasciatum.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Mandible and palp.
 4. First foot-jaw.
 5. Second foot-jaw.
 6. Foot of first pair.
 7. Outer branch of fourth foot.
 8. Foot of fifth pair, female.
 9. Last thoracic segment and abdomen of male.

Porcellidium tenuicauda.

10. Inner branch of posterior antenna.
11. Mandible and palp.
12. Maxilla.
13. Foot of second pair.



1. Body lat.
2. Head side view.

1-9 *Scutellidium fasciatum*.
10-13 *Porcellidium tenuicauda*.

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PLATE LXX.

Porcellidium fimbriatum.

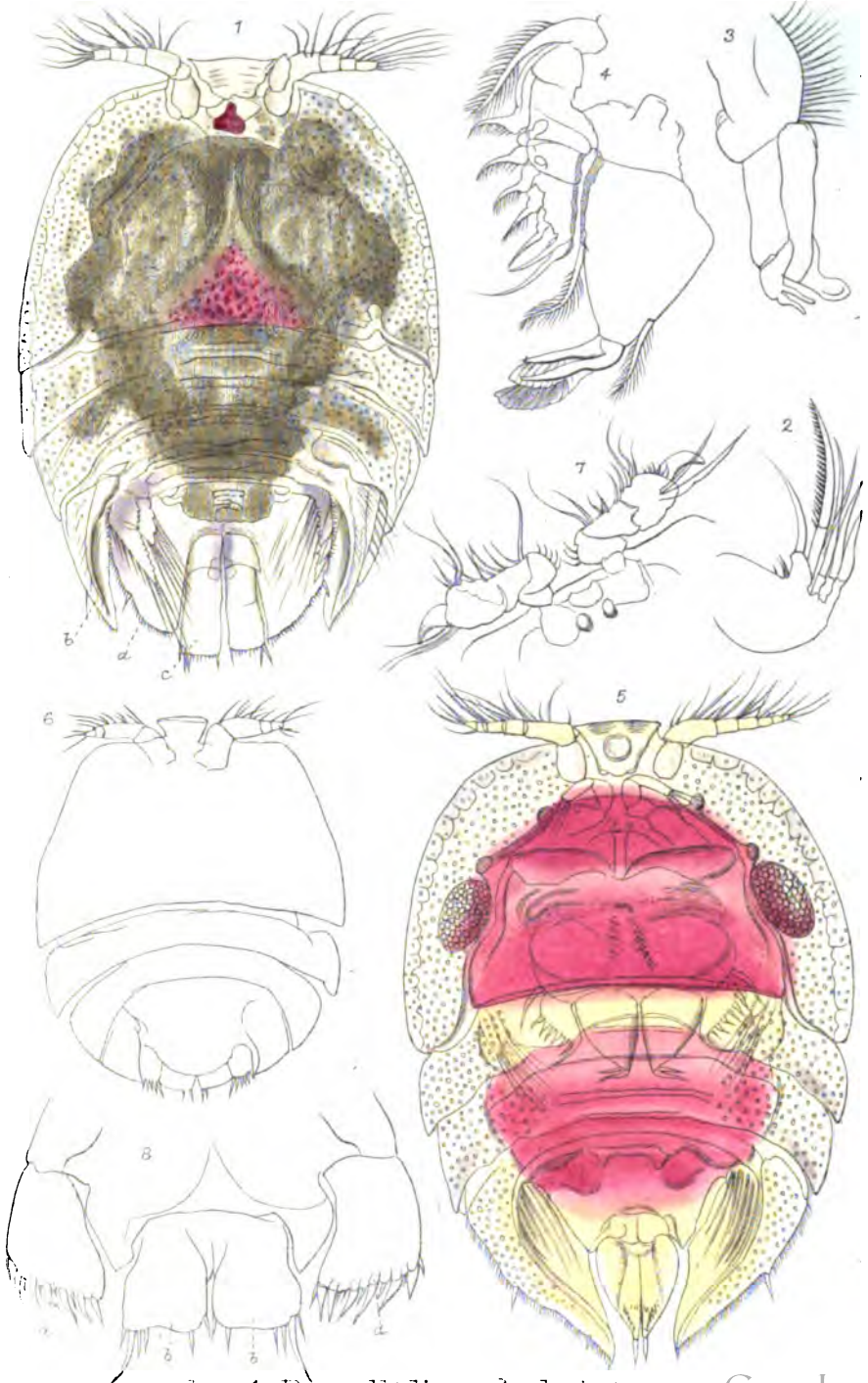
- Fig. 1. Adult female.
2. First foot-jaw.
3. Second foot-jaw.
4. Foot of first pair.

Porcellidium tenuicauda.

5. Adult female.

Porcellidium viride.

6. Adult female.
7. Anterior antennæ of male.
8. Fifth pair of feet, abdomen, and tail of male.



1--4 *Porcellidium fimbriatum*
 5 " *tenuicauda*
 6--8 " *viride*

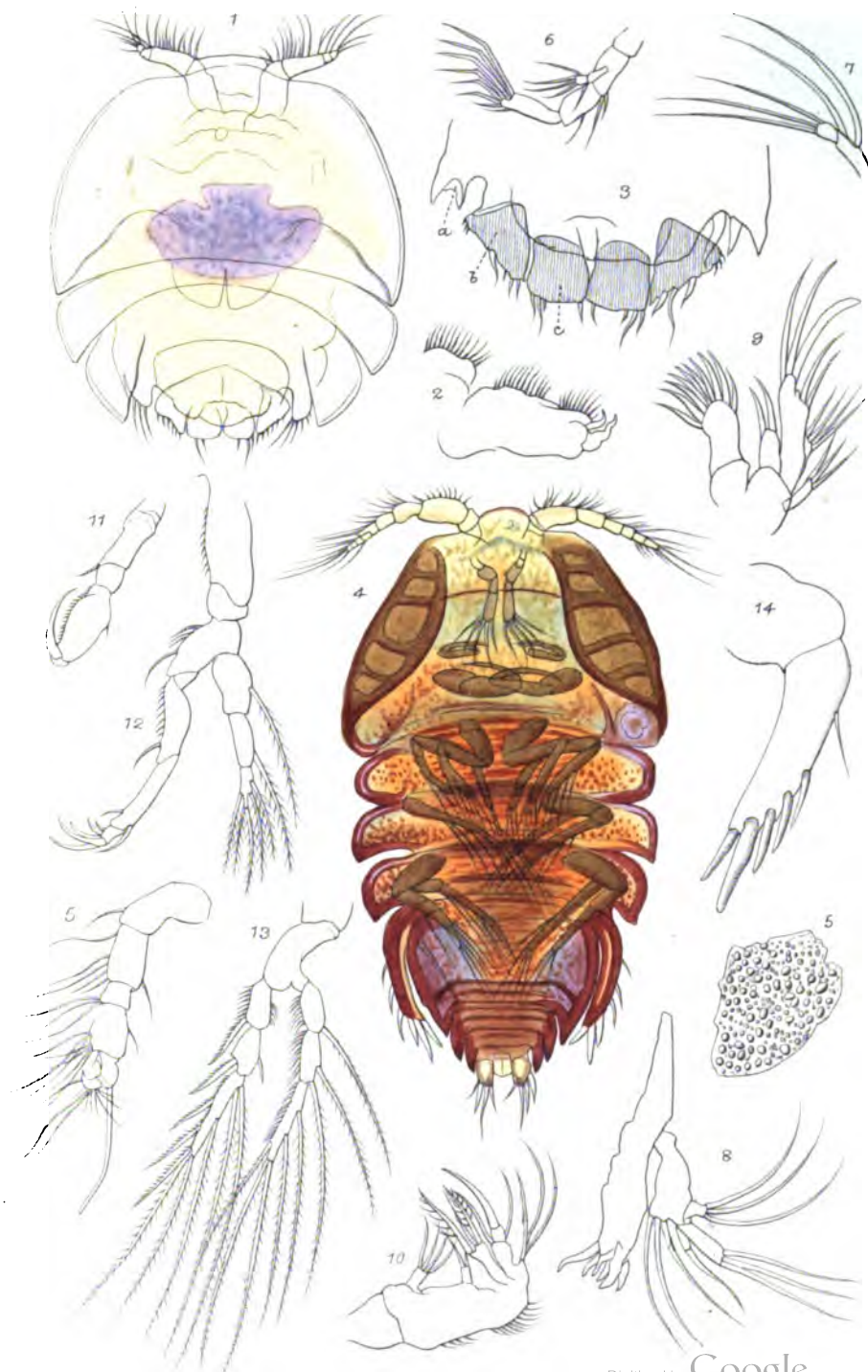
PLATE LXXI.

Porcellidium subrotundum.

- Fig. 1. Adult female.
2. Second foot-jaw.
3. Fifth pair of feet and caudal segments.

Peltidium interruptum.

4. Adult female.
5. Anterior antenna, male.
6. Posterior antenna.
7. Inner branch of posterior antenna.
8. Mandible and palp.
9. Maxilla.
10. First foot-jaw.
11. Second foot-jaw.
12. Foot of first pair.
13. Foot of third pair.
14. Foot of fifth pair, male.
15. Portion of integument.



Pericallidium
subrotundum

1-3 *Pericallidium subrotundum*.
4-15 *Pericallidium interruptum*

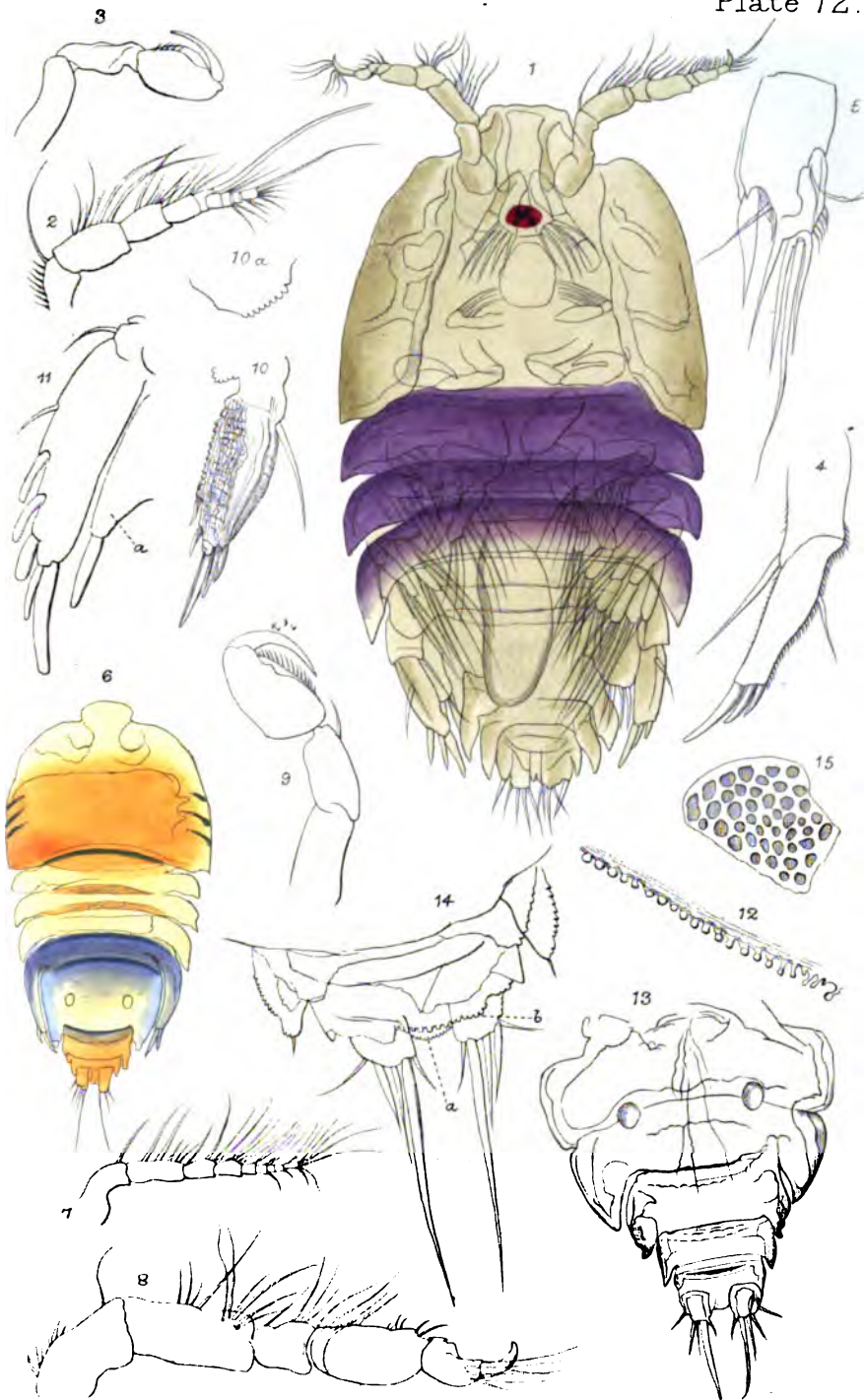
PLATE LXXII.

Peltidium depressum.

- Fig. 1. Adult male.
2. Anterior antenna, female.
3. Posterior foot-jaw.
4. Fifth foot, female.
5. Caudal segment, female.

Peltidium crenulatum.

6. Adult female.
7. Anterior antenna, female.
8. Anterior antenna, male.
9. Posterior foot-jaw.
10. Foot of fifth pair, female.
10 *a*. Inner angle of peduncle of fifth foot.
11. Foot of fifth pair (male) and angle of first abdominal segment (*a*).
12. Hinder margin of thoracic segment.
13. Abdomen of female.
14. Abdomen of male.
15. Portion of integument.



Body: col.
all black: hls.

1-5 *Peltidium depressum*
6-11 *P. aciculatum*.

W. West & Co. imp.

Digitized by Google

PLATE LXXIII.

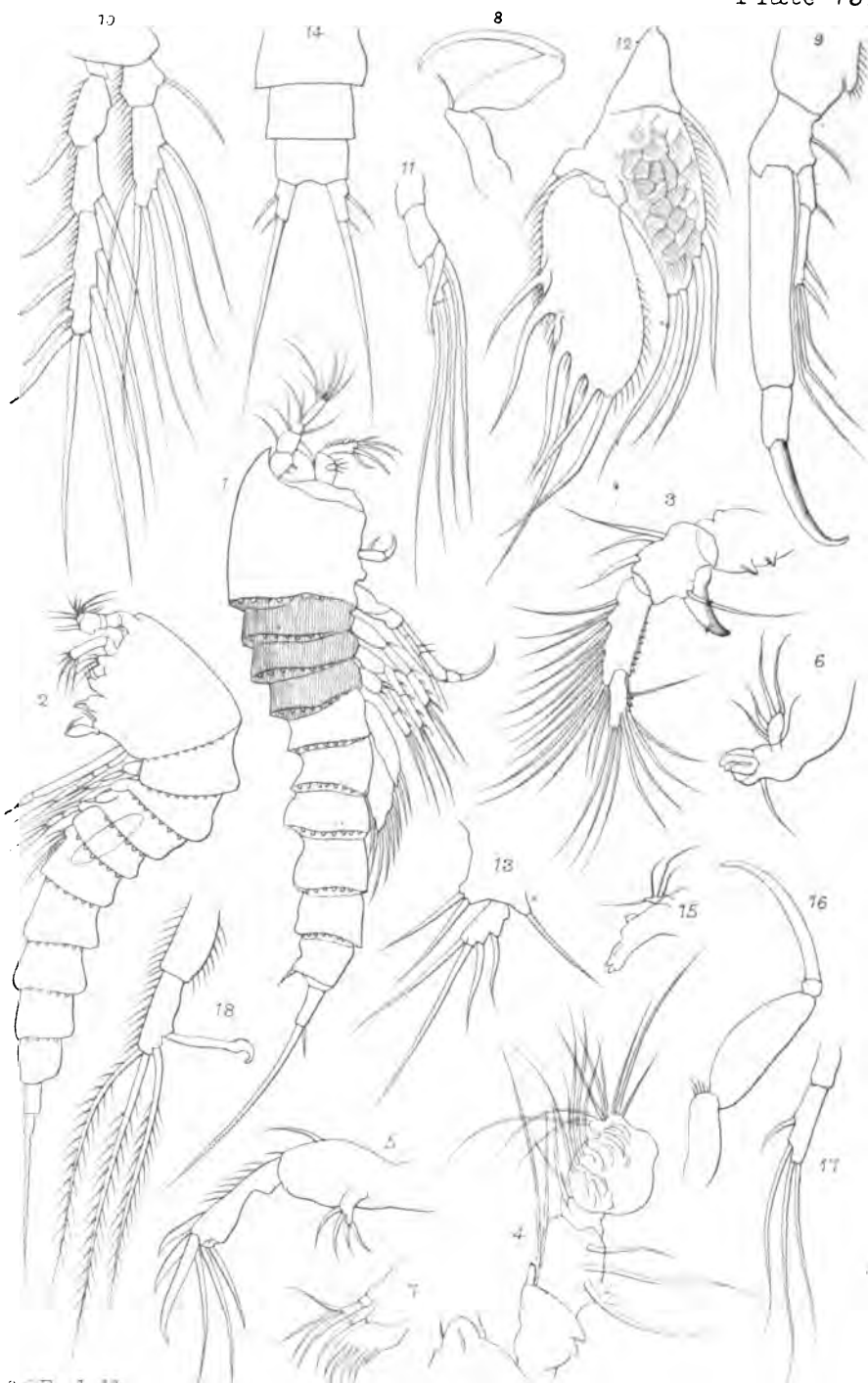
Laophonte serrata.

- Fig. 1. Adult female.
2. Adult male.
3. Anterior antenna of female.
4. Anterior antenna of male.
5. Posterior antenna.
6. Mandible.
7. Maxilla.
8. Posterior foot-jaw.
9. Foot of first pair.
10. Foot of third pair.
11. Inner branch of second foot, male.
12. Foot of fifth pair, female.
13. Foot of fifth pair, male.
14. Abdomen and tail.

*Laophonte curticauda.**

15. Mandible.
16. Second foot-jaw.
17. Inner branch of second foot, female.
18. Inner branch of second foot, male.

* For the numerals 12—15 on the Plate read 15—18.



G. S. Brady del.
T. H. Bell del.

W. Hancock & Co. imp.

1-14 *Laophonte serrata*.
12-15 " *Eulimnadia*.

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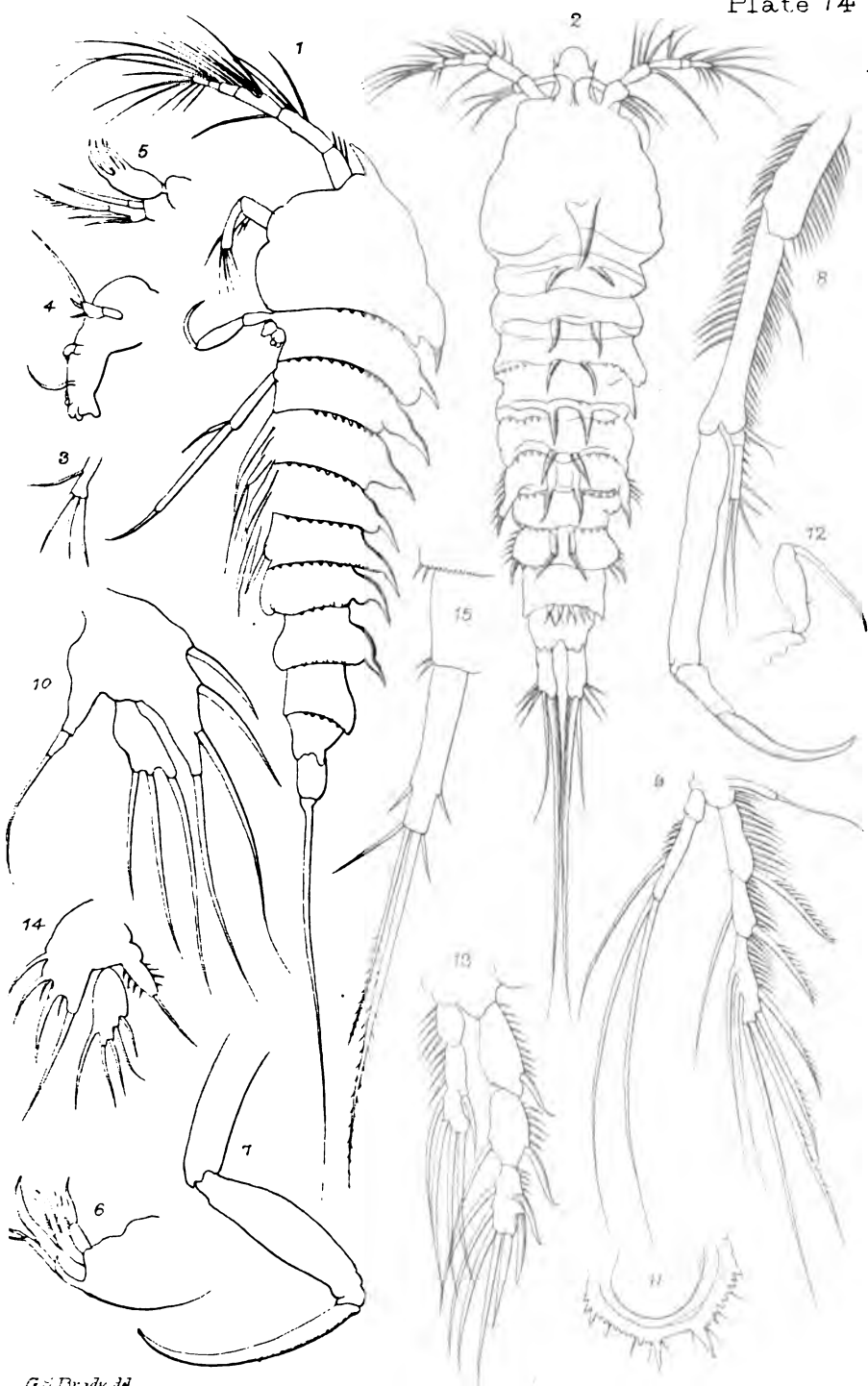
PLATE LXXIV.

Laophonte horrida.

- Fig. 1. Adult female, from side.
2. Adult female, from above.
3. Secondary branch of posterior antenna.
4. Mandible.
5. Maxilla.
6. First foot-jaw.
7. Second foot-jaw.
8. Foot of first pair.
9. Foot of second pair
10. Foot of fifth pair, female.
11. Transverse view of thoracic segment.

Laophonte longicaudata.

12. Second foot-jaw.
13. Foot of third pair, male.
14. Foot of fifth pair, female.
15. Caudal segment.



G. E. Brady Ill.
 After Brady's Ill.

W. H. M. & Co. Ill.

1-11 *Laophonte horrida* ♀
 12-15 " *longicaudata*

Digitized by Google

PLATE LXXV.

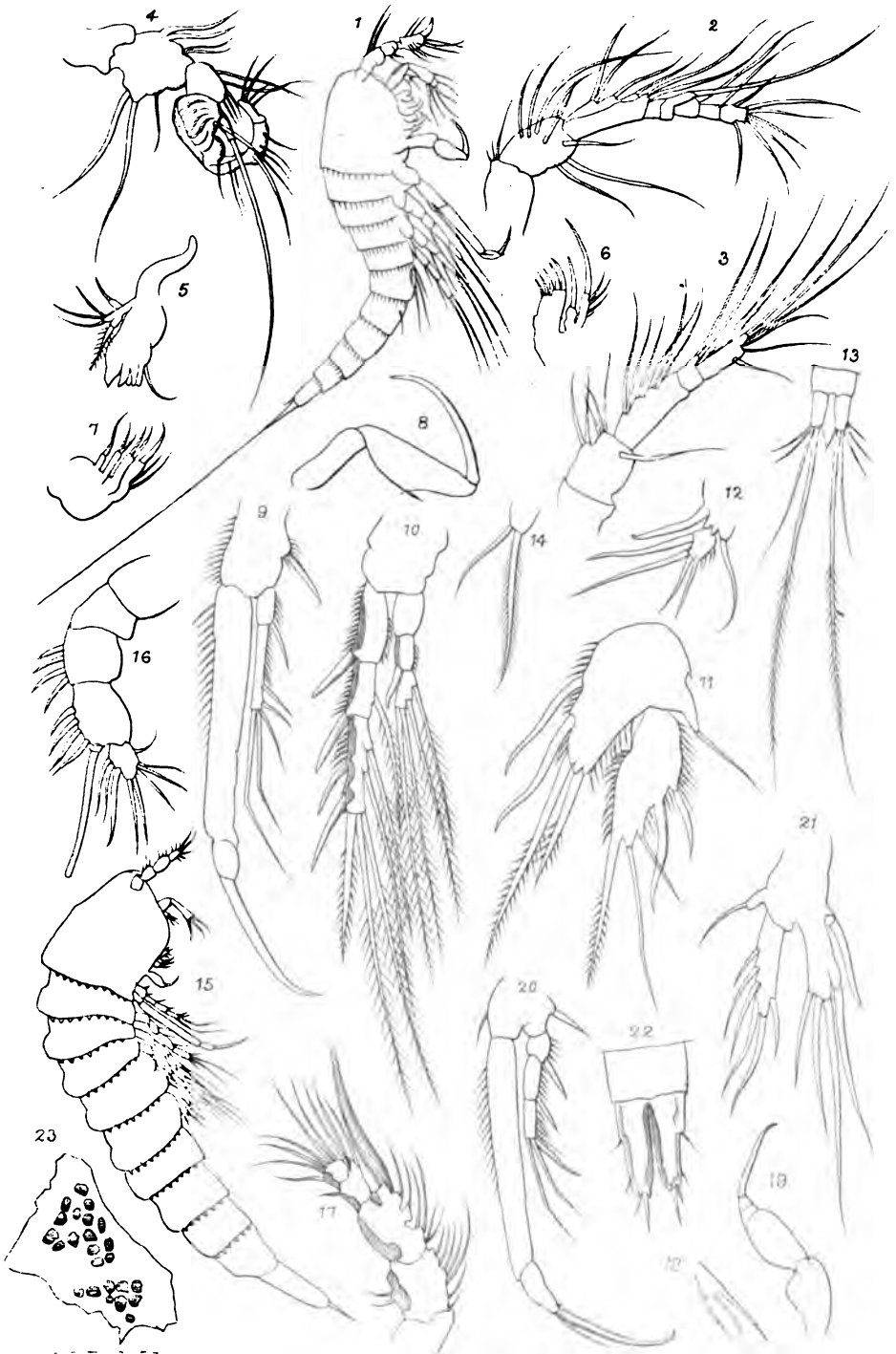
Laophonte similis.

Fig. 1. Adult male.

2. Anterior antenna, female.
3. Anterior antenna, female, *variety*.
4. Anterior antenna, male.
5. Mandible.
6. Maxilla.
7. First foot-jaw.
8. Second foot-jaw.
9. Foot of first pair.
10. Foot of second pair, male.
11. Foot of fifth pair, female.
12. Foot of fifth pair, male.
13. Caudal segments.
14. Appendage of first abdominal segment.

Laophonte lamellifera.

15. Adult female.
16. Anterior antenna, female.
17. Anterior antenna, male.
18. Inner branch, posterior antenna.
19. Second foot-jaw.
20. Foot of first pair.
21. Foot of fifth pair, female.
22. Caudal segments.
23. Portion of integument more highly magnified.



6125-6127 3/27

1-14 *Laophonte similis* by Google
 15-23 " *lanellifera*.

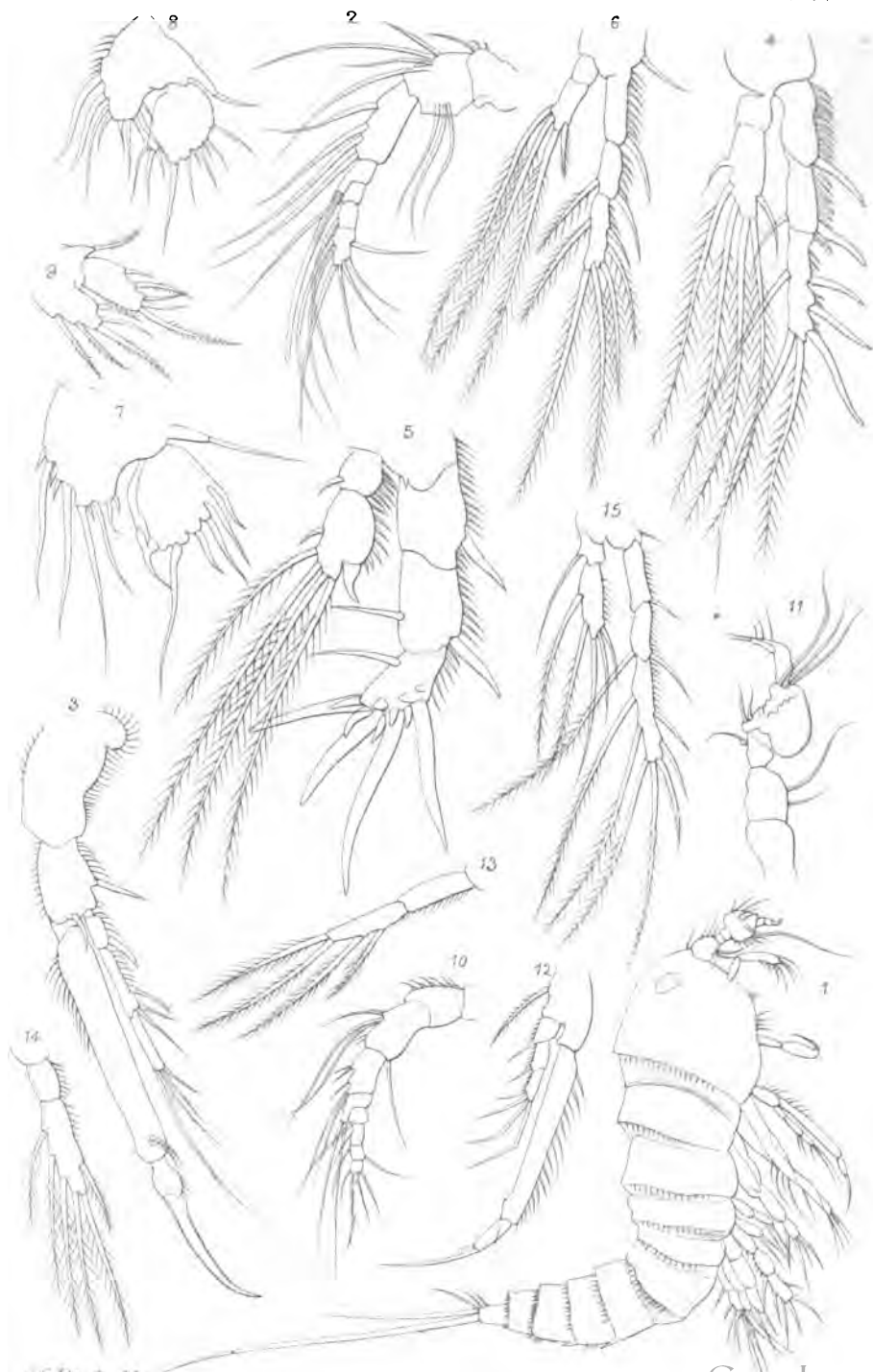
PLATE LXXVI.

Laophonte curticauda.

- Fig. 1. Adult male.
2. Anterior antenna, female.
 3. Foot of first pair.
 4. Foot of third pair, female.
 5. Foot of third pair, male.
 6. Foot of fourth pair, female.
 7. Foot of fifth pair, female.
 8. Foot of fifth pair, female, *variety*.
 9. Foot of fifth pair, male.

Laophonte longicaudata.

10. Anterior antenna, female.
11. Anterior antenna, male.
12. Foot of first pair.
13. Inner branch, second foot, female.
14. Inner branch, third foot, female.
15. Foot of fourth pair.



U.S. Brady del.
 A.T. Hollock lith.

1-9 *Laophonte curticauda*
 10-15

PLATE LXXVII.

Laophonte thoracica.

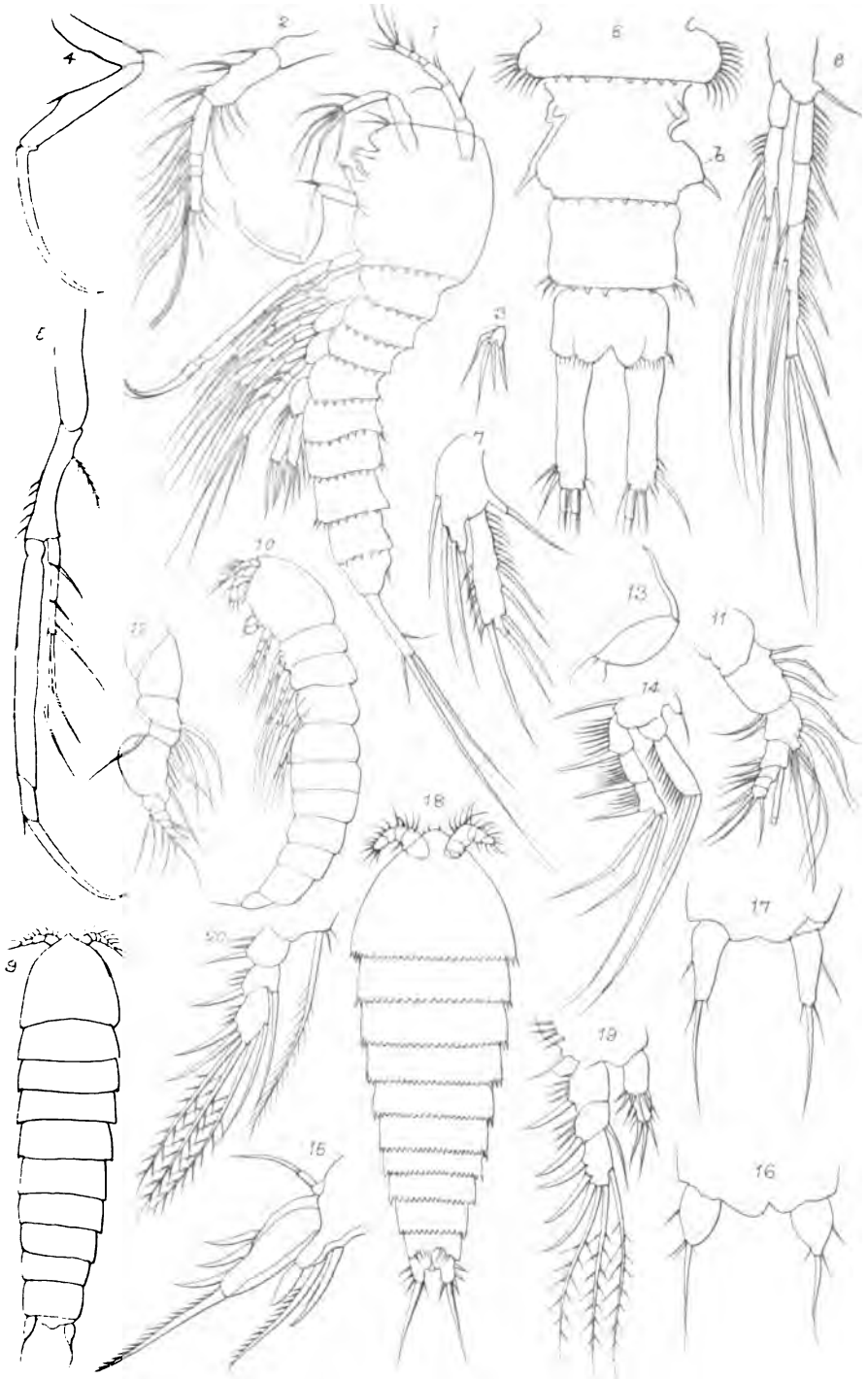
- Fig. 1. Adult female.
2. Anterior antenna, female.
3. Inner branch, lower antenna.
4. Second foot-jaw.
5. Foot of first pair.
6. Foot of third pair.
7. Foot of fifth pair, female.
8. Abdomen and caudal segments.

Cletodes propinqua.

9. Adult female, from above.
10. Adult female, from side.
11. Anterior antenna, female.
12. Anterior antenna, male.
13. Second foot-jaw.
14. Foot of first pair.
15. Foot of fifth pair, female.
16. Tail of female.
17. Tail of male.

Nannopus palustris.

18. Adult female.
19. Foot of first pair.
20. Foot of third pair.



10 Brady 1891
11 1891

1-8 *Laophonte thoracica* 9
9-17 *Cletodes propinqua*.
18-20 *Nannopus palustris*.

Google
W. West & Co. 19

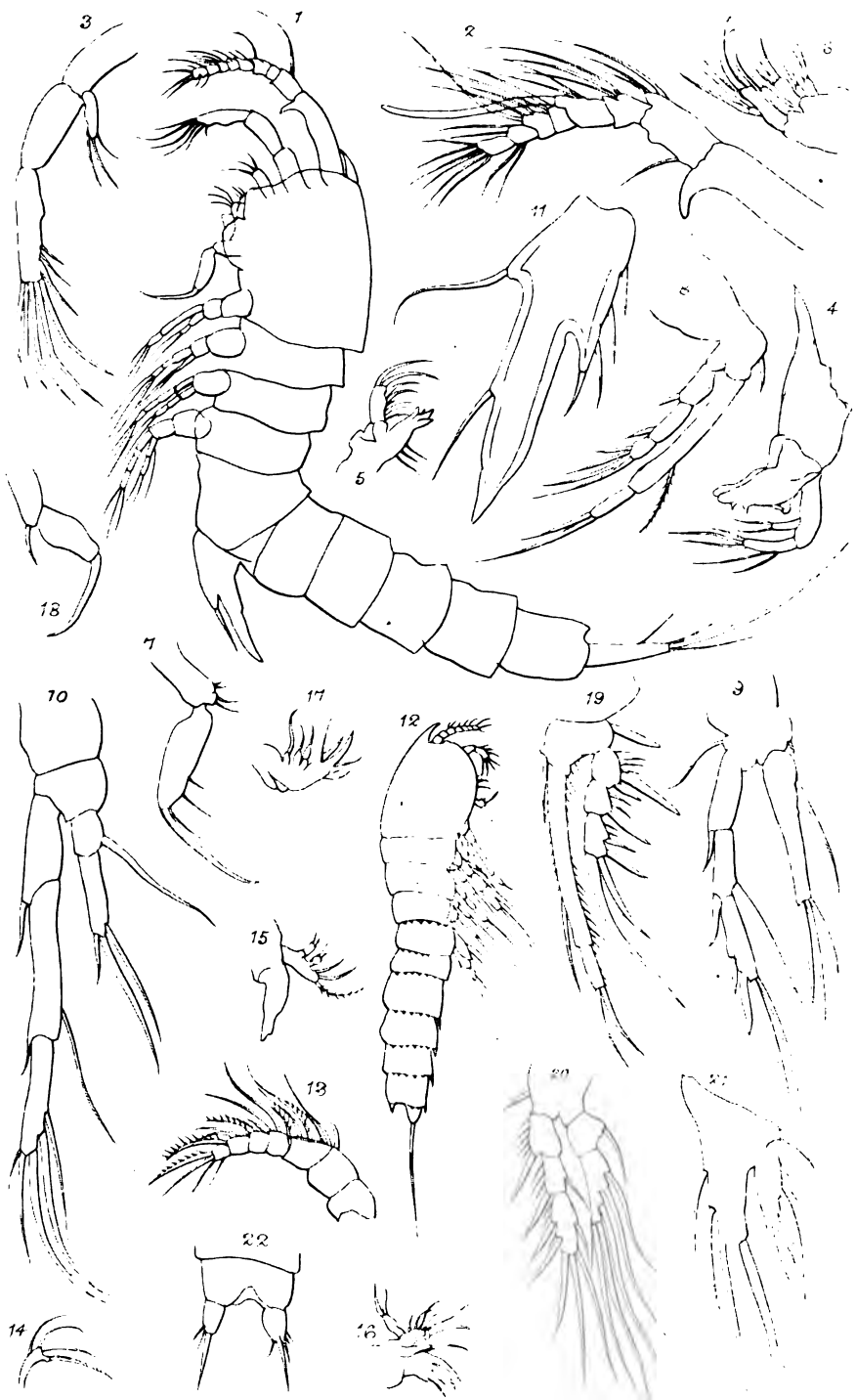
PLATE LXXVIII.

Tetragoniceps malleolus.

- Fig. 1. Adult female.
2. Anterior antenna, female.
 3. Posterior antenna.
 4. Mandible.
 5. Maxilla.
 6. First foot-jaw.
 7. Second foot-jaw.
 8. Foot of first pair.
 9. Foot of third pair.
 10. Foot of fourth pair.
 11. Foot of fifth pair, female.

Normanella dubia.

12. Adult female.
13. Anterior antenna, female.
14. Inner branch of lower antenna.
15. Mandible.
16. Maxilla.
17. First foot-jaw.
18. Second foot-jaw.
19. Foot of first pair.
20. Foot of second pair.
21. Foot of fifth pair, female.
22. Caudal segments.



G.S. Brady, Ill.
A.T.H. & Co. Ill.

1-11, *Tetragoneiceps multilata* G.S.
12-22, *Normanella dubia* G.S.

PLATE LXXIX.

Cletodes limicola.

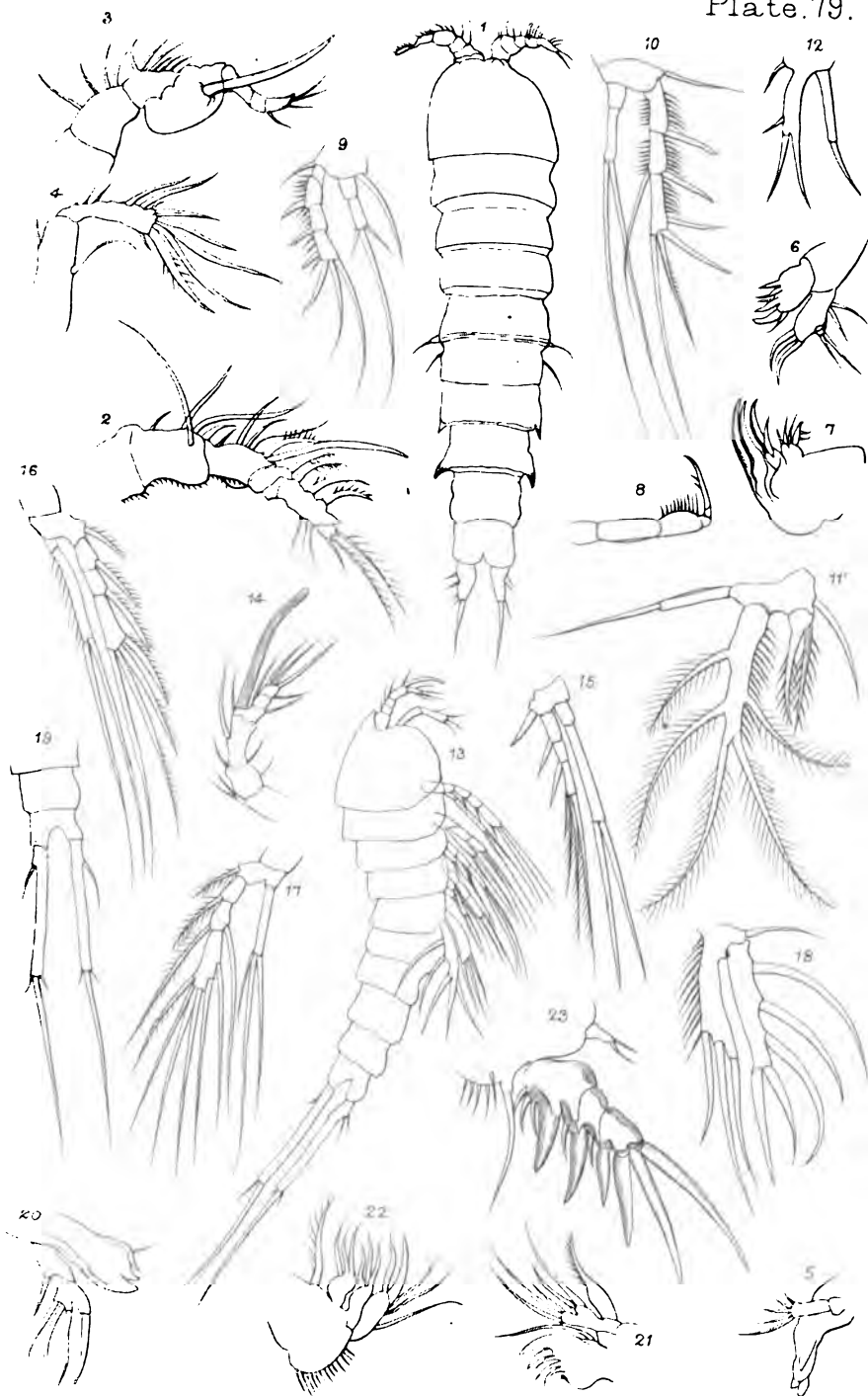
- Fig. 1. Adult female.
2. Anterior antenna, female.
3. Anterior antenna, male.
4. Posterior antenna.
5. Mandible.
6. Maxilla.
7. First foot-jaw.
8. Second foot-jaw.
9. Foot of first pair.
10. Foot of third pair.
11. Foot of fifth pair, female.
12. Foot of fifth pair, male.

Cletodes longicaudata.

13. Adult female.
14. Anterior antenna, female.
15. Foot of first pair.
16. Foot of third pair.
17. Foot of fourth pair.
18. Foot of fifth pair, female.
19. Tail.

Platychelipus littoralis.

20. Mandible.
21. Maxilla.
22. First foot-jaw.
23. Foot of third pair.



S. Brady del.
A. Milne-Edwards lith.

1-12, *Cletodes limicola*.
13-19, " *longicaudata* ?
20-22, *Platyhelipus littoralis*.

PLATE LXXX.

Cletodes linearis.

- Fig. 1. Adult male.
2. Anterior antenna, female.
 3. Anterior antenna, male.
 4. Posterior antenna.
 5. First foot-jaw.
 6. Second foot-jaw.
 7. Foot of first pair.
 8. Foot of second pair.
 9. Foot of third pair, male.
 10. Foot of fourth pair.
 11. Foot of fifth pair, female.
 12. Foot of fifth pair, male.
 13. Caudal and last abdominal segments.
 14. Portion of integument, highly magnified.

Platychelipus littoralis (female).

15. Anterior antenna.
16. Foot of first pair.
17. Foot of second pair.
18. Foot of fifth pair.
19. Second foot-jaw.



G. S. Brady del.
A. H. S. lith.

1-14, *Clotodes linearis*.
15-19, *Platychelopus littoralis*

PLATE LXXXI.

Laophonte hispida.

Fig. 1. Adult female.

2. Anterior antenna, female.
3. Mandible.
4. Maxilla.
5. First foot-jaw.
6. Second foot-jaw.
7. Foot of first pair.
8. Inner branch of second foot.
9. Foot of fourth pair.
10. Foot of fifth pair.
11. One of the caudal laminæ and a portion of the abdomen.

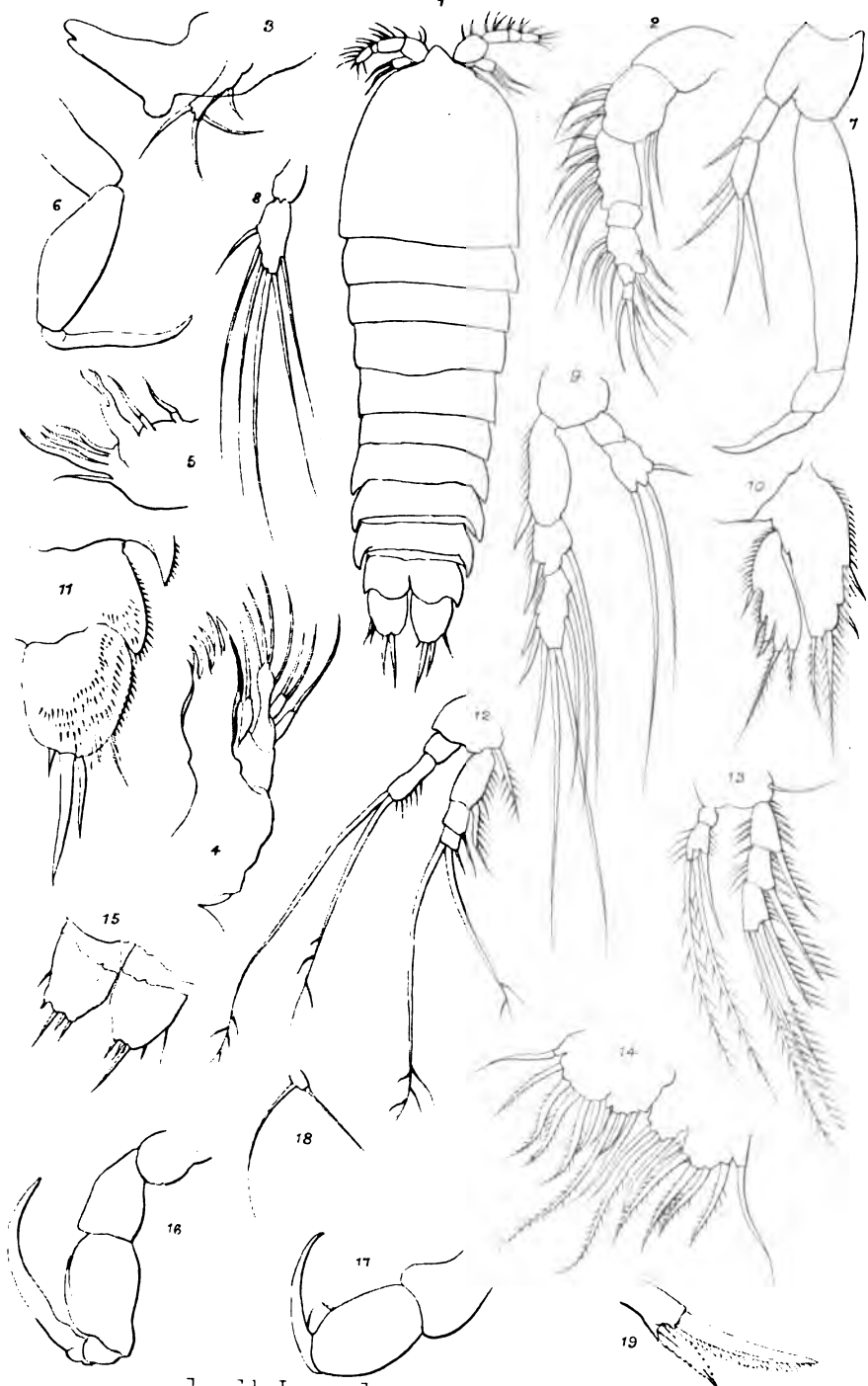
*Enhydrosoma curvatum.**

12. Foot of first pair.
13. Foot of third pair.
14. Fifth pair of feet, male.
15. Caudal laminæ.

Corycæus anglicus.

16. Second foot-jaw of male.
17. Second foot-jaw of female.
18. Foot of fifth pair.
19. Terminal spines of one of swimming feet.

* On the plate, for *Enhydrosoma curvata* read *Enhydrosoma curvatum*.



Laophonte hispida det.
A. T. S. 1917.

1-11. *Laophonte hispida* ♀.
12-15. *Enhydrosoma curvata*.
16-19. *Corycoeus anglicus*.

W. M. & Co. Imp.

PLATE LXXXII.

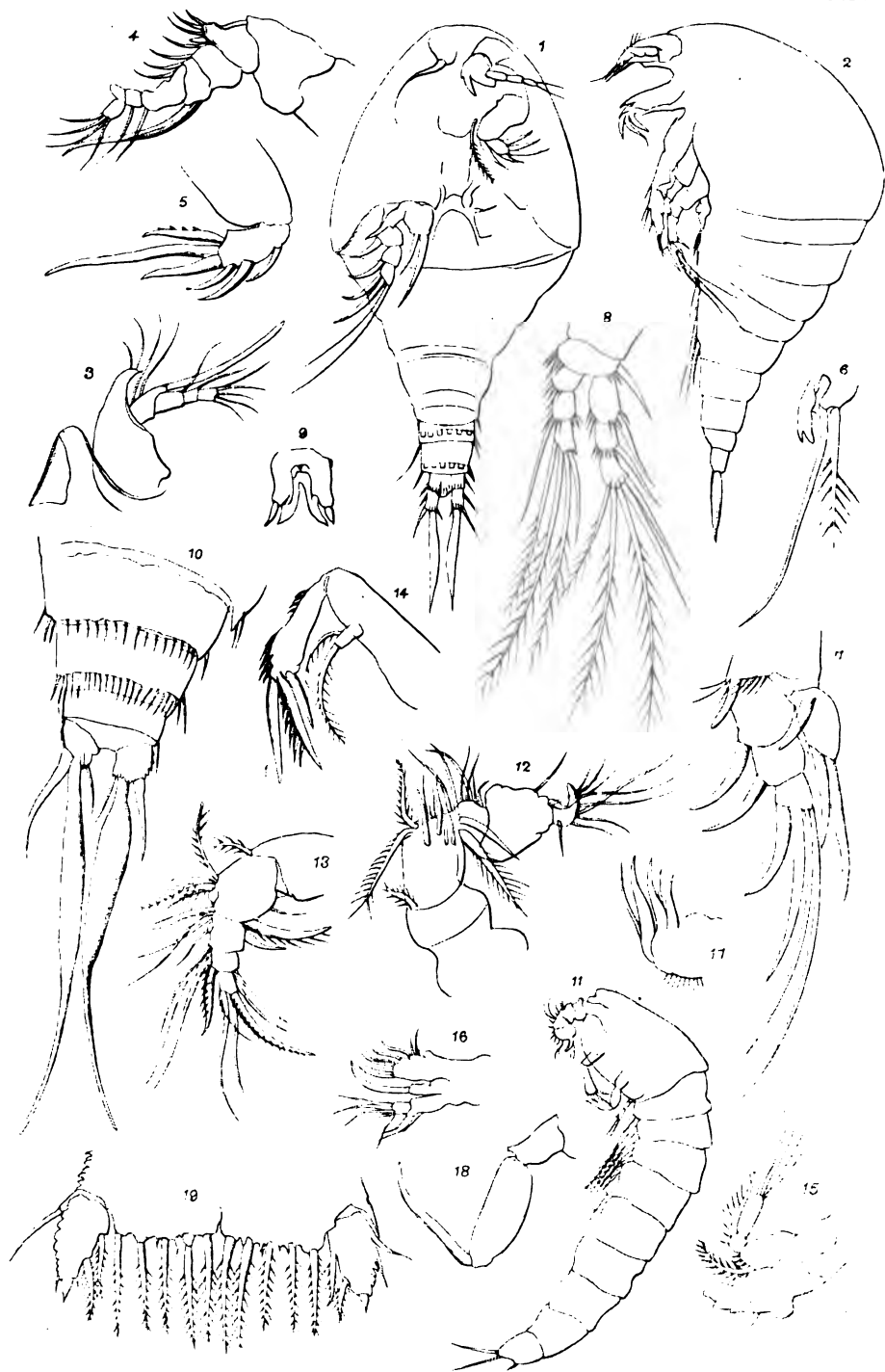
Ilyopsyllus coriaceus.

- Fig. 1. Female, seen from below.
2. Female, seen from side.
3. Anterior antenna, female.
4. Anterior antenna, male.
5. Posterior antenna.
6. Mandible.
7. Foot of first pair.
8. Foot of third pair.
9. Fifth pair of feet, male.
10. Abdomen and tail.

Enhydrosoma curvatum.*

11. Adult male, seen from side.
12. Anterior antenna, male.
13. Anterior antenna, female.
14. Posterior antenna.
15. Mandible.
16. Maxilla.
17. First foot-jaw.
18. Second foot-jaw.
19. Fifth pair of feet.

* On the plate, for *Enhydrosoma curvata* read *Enhydrosoma curvatum*.



622. 19. 10.
A. H. 19. 10.

1-10. *Hypersyllus coriaceus*.
11-19. *Phnydresoma curvata*.

